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Generic Essential Fish Habitat Amendment 5

Draft Options Document for Generic Amendment 5 to the Shrimp, Reef fish, Coastal Migratory Pelagics, Spiny Lobster, and Red Drum Fishery Management Plans of the Gulf of Mexico

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ABBREVIATIONS USED IN THIS DOCUMENT

Council	Gulf Council
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ER	Eco-regions
EJ	Early Juvenile
FEIS	Final Environmental Impact Statement
FGBNMS	Flower Garden Banks National Marine Sanctuary
FMP	Fishery Management Plan
Gulf	Gulf of America
HAPC	Habitat Areas of Particular Concern
HAT	Habitat Attribute Table
LJ	Late Juvenile
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
SA	Spawning Adult
SERO	Southeast Regional Office

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CHAPTER 1. INTRODUCTION

1.1 Background

In 1996, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) was amended to require that each fishery management plan (FMP) describe and identify essential fish habitat (EFH) to minimize, to the extent practicable, adverse effects on that habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of that habitat. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The National Marine Fisheries Service (NMFS) and regional Fishery Management Councils (Councils) must describe and identify EFH in FMPs, to minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH (50 CFR 600.815). Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with NMFS, and NMFS must provide conservation recommendations to federal and state agencies regarding actions that would adversely affect EFH. The EFH guidelines require descriptions and identifications for each life stage for every species managed in the FMP. Councils also have the authority to comment on federal or state agency actions that would adversely affect the habitat, including EFH, of managed species.

Regulations specify the EFH information that must be included in the FMP and require that the regional Councils and NMFS should perform a complete review of all EFH information at least once every 5 years (50 CFR 600.815(a)(10)). The EFH 5-year review process is a mechanism used within the Council process to ensure that EFH information is updated on a regular basis, and to incorporate the best available scientific information available into EFH designations and accompanying habitat information. Staff use information from published or unpublished scientific literature and/or scientific data that meets acceptable standards of scientific review. The Gulf Council's role with respect to the EFH 5-year Review is to receive a report on the review and determine whether any of the new information, highlighted in the review, warrants change to management (i.e., amendments to the FMPs). The EFH 5-year review considers all 10 EFH components:

1. EFH Descriptions and Identification;
2. Fishing activities that may adversely affect EFH;
3. Non-MSA fishing activities that may adversely affect EFH;
4. Non-Fishing activities that may adversely affect EFH;
5. Cumulative impacts analysis;
6. EFH Conservation and Enhancement Recommendations;
7. Prey species list and any locations;
8. Habitat Areas of Particular Concern (HAPC) identification;
9. Research and Information needs; and
10. Recommendation to review EFH every 5 years.

Any change to the EFH descriptions and identification require an FMP amendment. When designating EFH, the Council should strive to describe and identify EFH information for all

federally managed species within the FMPs at the highest level possible (50 CFR 600.815(a)(1)(iii)(B))—.

- *Level 1: Distribution data are available for some or all portions of the geographic range of the species*
- *Level 2: Habitat-related densities of the species are available*
- *Level 3: Growth, reproduction, or survival rates within habitats are available*
- *Level 4: Production rates by habitat are available*

The lower characterization levels (one and two) can be satisfied using qualitative descriptions of habitat or species presence/absence data; however, upper levels (three and four) require more comprehensive data needs as these levels address functionality of habitat attributes to population dynamics. In some cases, species presence may not be available and as such cannot be used. In these cases, habitat maps along with habitat use information obtained from a primary literature review is used describe EFH. Currently, the Gulf Council (Council) uses a qualitative approach to define habitat associations for species to mapping benthic habitat features for species throughout the Gulf of America (Gulf).

Consistent with the requirements of the Magnuson-Stevens Act, the Council completed EFH Generic Amendment 1 in 1998 (October 1998; GMFMC 1998), which amended the seven Gulf FMPs in existence at the time (shrimp, reef fish, coastal migratory pelagics, spiny lobster, coral, red drum, and stone crab[1]). EFH Generic Amendment 1 included descriptions of essential habitat for each life stage of 26 representative species that constituted most of the landings from the Gulf. EFH Generic Amendment 1 also described threats to habitats, predator-prey relationships, factors resulting in EFH losses, conservation and enhancement measures for EFH, and included recommendations to minimize impacts from non-fishing threats.

EFH Generic Amendment 2 (GMFMC 2001) created two marine reserves (Tortugas Marine Reserves) and prohibited fishing. This amendment affected all seven Gulf FMPs in existence at the time. The first reserve established was a single 60 square mile area to protect a spawning aggregation site for mutton snapper within Council jurisdiction. The other (125 square miles) affected all managed species and was created in the jurisdictions of the National Park Service, Florida Keys National Marine Sanctuary, Council, and State of Florida.

In 2000, a coalition of environmental groups challenged the National Marine Fisheries Service's (NMFS) approval of the EFH FMP amendments prepared by the Gulf and other Fishery Management Councils. NMFS entered into a Joint Stipulation with the plaintiff environmental organizations that called for each affected Council to complete an Environmental Impact Statement (EIS). This resulted in the 2004 EFH Final Environmental Impact Statement (FEIS) (GMFMC 2004). The purpose of the EFH FEIS was to analyze (within each Gulf fishery) a range of alternatives to: (1) describe and identify EFH for the fishery, (2) identify other actions to encourage the conservation and enhancement of such EFH and (3) identify measures to prevent, mitigate or minimize to the extent practicable the adverse effects of fishing on such EFH.

[1] In 2011, the Council rescinded jurisdictional management of stone crab and removed the FMP. Therefore, the Council no longer considers EFH descriptions and identifications for stone crab.

The EFH FEIS (GMFMC 2004) led to EFH Generic Amendment 3 (GMFMC 2005), which addressed EFH requirements by comparing benthic habitat maps and species life history habitat attribute tables constructed from literature reviews. The EFH Generic Amendment 3 (GMFMC 2005) described and identified EFH as areas of higher species density, based on the National Oceanic and Atmospheric Administration (NOAA) Atlas (NOAA 1985) and functional relationships analysis for the Red Drum, Reef Fish, CMPs, Shrimp, Stone Crab[1], and Spiny Lobster FMPs; and on known distributions for the Coral FMP. The EFH generic Amendment 3 defined EFH for federally managed species in the gulf, by broadly characterizing EFH for the entirety of the Gulf FMP species (e.g. all reef fish species contain the same EFH designation).

The 2010 EFH 5-year review reviewed both the existing EFH descriptions and designations, and any new relevant information since the 2005 EFH Amendment (GMFMC 2010). The 2010 review also examined changes and new information on fishing and non-fishing impacts that could adversely affect EFH. The review also described potential new methods of designating EFH. Lastly, the review considered HAPC designations and determined if current HAPC designations are adequate or if areas need to be removed or added. The 2010 review was evaluated by NMFS and did not result in any changes to Gulf FMPs.

The 2016 EFH 5-year review (GMFMC 2016) included an extensive literature review which was conducted to determine if any new species-specific EFH information was available. habitat attribute tables developed in the EFH FEIS (GMFMC 2004) were revised to make them more readable and to incorporate new information from the literature review. The habitat attribute tables were used to generate species profiles, that include brief synopses of pertinent literature obtained during the review, a description of habitat information by species and life stage, graphs of growth by age and recent fishing effort, a brief fishery history, and a composite map of benthic life stages for each species. For the first time, Level 1 species-specific EFH identification and descriptions (text and maps) were produced for species by life stage (egg, larvae, post larvae, early juvenile, late juvenile, adult, and spawning adult). A literature review was also conducted of new information related to fishing and non-fishing impacts, focused particularly on the Deepwater Horizon oil spill, offshore aquaculture, and invasive species. The 2016 review did not result in any changes to Gulf FMPs; however, the NMFS Southeast Regional Office (SERO) Habitat Conservation Division sent a letter to the Council recommending that the Council amend its FMPs to incorporate new habitat life-history functional relationships into existing EFH identification and descriptions, which will better inform the consultations on actions that may adversely affect EFH, as required by section 305(b) of the Magnuson-Stevens Act.[2]

One of the requirements for the 5-year reviews is to evaluate the EFH Generic Amendment 3 (GMFMC 2005) for errors in existing EFH descriptions or identification. This was completed during the 2010 5-year review (GMFMC 2010) and several items from the EFH Generic Amendment 3 (GMFMC 2005) were found to be inconsistent. The Council has not acted on the 5-year review results from the 2010 or 2016 review; thus, through the 2025 EFH 5-year Review and this Generic FMP amendment addresses the following EFH description or identification and present inconsistencies:

[2] https://drive.google.com/file/d/1wuuKSXO-S-MEJqPtEiRIl0dW-KMN5VLv/view?usp=sharing

- Some discrepancies between textual and mapped depictions of EFH (per the EFH Final Rule, the textual description is ultimately determinative of the limits of EFH).
- Inconsistencies in digitization of the NOAA Atlas maps depicting Lake Rousseau as EFH for several FMPs, despite being a strictly freshwater lake with a lock and dam system that blocks marine fishery ingress or egress.

The 2025 EFH 5-year review aims to update the EFH text descriptions and identification to dissemination EFH Level 1 information into the Gulf FMPs, as available for species at 7 life stages. Thorough review of literature encompassed both published and unpublished scientific literature/reports (gray literature), incorporation of local knowledge, and utilizing previously unavailable or inaccessible data through 2024. For this iteration of the document, staff highlight the methodological changes to Component 1: EFH maps and text descriptions to modify the current EFH definitions to be in accordance with the best science information available (BSIA), and updated habitat attribute tables (Appendix A). The remaining components (C2:fishing effects, C3: Non-MSA fishing activities that may adversely affect EFH, C4: Non-Fishing activities that may adversely affect EFH, C6: EFH Conservation and Enhancement Recommendations, C7: Prey species, C8: Habitat Areas of Particular Concern (HAPC) identification, C9: Research and Information needs, and C10:Recommendation to review EFH every 5 years) being addressed during this EFH 5-year Review will be provided in subsequent iterations of the document. The EFH 5-year review will encompass a thorough literature review includes specific searches for fishing and non-fishing impacts that are new or have changed since the previous 5-year review. Since the implementation of EFH Generic Amendment 3, two 5-year EFH reviews have been completed, but EFH descriptions have not been updated through an amendment, The 2025 EFH 5-year review and Generic Amendment 5 aims to update EFH descriptions and identifications through an amendment process while concurrently conducting a thorough review to address all 10 components of an EFH 5-year review.

1.2 History of Management

EFH Generic Amendment 1 (GMFMC 1998): Amended the seven Gulf FMPs in existence at the time. Additionally, EFH descriptions and identifications are required for each life stage for every species managed within an FMP. EFH Generic Amendment 1 included descriptions of essential habitat for each life stage of 26 representative species that constituted most of the landings from the Gulf. EFH Generic Amendment 1 also described threats to habitats, predator-prey relationships, factors resulting in EFH losses, conservation and enhancement measures for EFH, and included recommendations to minimize impacts from non-fishing threats.

EFH Generic Amendment 2 (GMFMC 2001): Amended the seven Gulf FMPs in existence at the time and established two marine reserves (Tortugas Marine Reserves). These reserves allowed for research on value of no-use reserves.

EFH FEIS (GMFMC 2004): The purpose of this document was to analyze (within each Gulf fishery) a range of alternatives to: (1) describe and identify EFH for the fishery, (2) identify other actions to encourage the conservation and enhancement of such EFH and (3) identify measures to prevent, mitigate or minimize to the extent practicable the adverse effects of fishing on such

EFH. This document satisfied the terms of a Joint Stipulation entered by NMFS and a coalition of environmental groups.

EFH Generic Amendment 3 (GMFMC 2005): This amendment described and identified EFH based on the National Oceanic and Atmospheric Administration (NOAA) Atlas (NOAA 1985) and functional relationships analysis for the Red Drum, Reef Fish, CMPs, Shrimp, Stone Crab, and Spiny Lobster FMPs; and on known distributions for the Coral FMP.

EFH 5-year Review (GMFMC 2010): The report reviewed both the existing EFH descriptions and designations, and also any new relevant information (since the 2005 EFH Amendment, which conducted literature review thorough 2004). The 2010 review also examined changes and new information on fishing and non-fishing impacts that could adversely affect EFH. This review also identified a number of habitat description errors in EFH Amendment 3; however, no modifications to any FMPs were made at the time.

EFH 5-year Review (GMFMC 2016): The report reviewed both the existing EFH descriptions and designations, and also any new relevant information by updating habitat association tables to literature published through 2016. The review updated the habitat association tables, by species life stage and updated species to Level 1 EFH identification and descriptions to be used in a web-tool. No modifications to any FMPs were made as a result of this information, but NMFS wrote a letter to the Council suggesting an amendment of EFH definitions take place to implement best scientific information available.

Amendment 9 to the Fishery Management Plan for Coral and Coral Reef Resources in Gulf of Mexico U.S. waters (GMFMC 2018): Established 13 new habitat areas of particular concern with fishing regulations, designated 8 new areas without fishing regulations, and modified the regulations in 3 existing areas. These areas were identified as having sufficient numbers and diversity of deep-water corals to be considered EFH.

1.3 Purpose and Need

The purpose is to comply with EFH provisions of the Magnuson-Stevens Act (MSA) (50 CFR Part 600, Subpart J). The EFH Final Rule states that a review of the EFH components of the Council's FMPs should be reviewed every 5 years and the EFH provisions should be revised or amended, as warranted, based on the best available science contributing new information. This amendment incorporates all information required by 50 C.F.R. section 600.815(a).

The need is to consider new available spatial habitat information to revise the EFH text and map descriptions for the Shrimp, Reef fish, Coastal Migratory Pelagics, Spiny Lobster, and Red Drum Gulf FMPs. Updates to EFH descriptions and identifications will allow the best scientific information available to be utilized to provide enhanced conservation benefits to the stock, and establish a better understanding of species habitat by life stage. This document will concurrently meet the requirements under the EFH 5-year Review.

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 - Modify Description and Identification of Essential Fish Habitat for all Gulf Fishery Management Plans

Alternative 1: No Action – Retain current description and identification of essential fish habitat (EFH) for Gulf Fishery Management Plans as outlined in EFH Generic Amendment 3 (2005).

Alternative 2: Update EFH identification and descriptions and habitat attribute tables to include primary research and technical literature sources through 2024. This alternative could be used for all managed species for every life stage, as data is available.

2.1.1 Methods to Define EFH under Action 1

Methods to identify and describe EFH qualitatively describe observed linkages in habitat-usage and reliance across all life stages, as described in the literature. To inform EFH for species, a thorough literature review through 2024 was conducted to update the species-specific habitat attribute tables.(Appendix A, Table 2.1.1). The habitat attribute tables provide insight into species habitat reliance by life stages as well as species-specific life history traits. Based on the information provided in the habitat attribute tables, species EFH definitions were created by combining identified habitat associations, eco zones (estuarine, nearshore, and offshore), and eco regions to describe EFH by life stage. Subsequent EFH maps were produced using benthic spatial data files acquired during previous review cycles, combined with new metadata acquired during the 2023/2024 Council-contracted work (Appendix B).

Level 1 EFH maps for species by life stage were produced and EFH text descriptions were defined using known associated habitat types, habitat zones, and eco-regions (Section 3.1). For those species life stages without information to inform an EFH description and identifications, no maps or text descriptions were defined and it was noted that "No information is available". This existing method can easily be updated and allows for the description and identification of EFH for all managed stocks, many of which are data poor. Since the implementation of EFH Generic Amendment 3 (GMFMC 2005), more refined spatial data, and research has been conducted to inform habitat maps for species by life stage. As such, the EFH text and map descriptions have been updated accordingly.

Table 2.1.1 A summary of sources compiled during the 2024 literature review used to inform habitat associations, by species. Updated sources are available through 2024, and include what information was updated in the Habitat Association Tables, found in Appendix A.

Species	Author(s)	Title	Year	HAT Information Updated
Reef Fish FMP				
Almaco jack				
Banded rudderfish				
Blackfin snapper	Overly and Shervette	Caribbean deepwater snappers: Application of the bomb radiocarbon age estimation validation in understanding aspects of ecology and life history	2023	Growth
Black grouper				
Blueline tilefish				
Cubera snapper	Gokturk et al.	Loss of suitable ocean habitat and phenological shifts among grouper and snapper spawning aggregations in the Greater Caribbean under climate change	2022	Eco-region
	Da Silva et al. 2023*	From fisher tales to scientific evidence: revealing the significance of estuarine and mangrove habitats as nursery grounds for juveniles of the largest Atlantic Ocean snapper	2023	Habitat Zone*
	Motta et al.*	Direct evidence of a spawning aggregation of cubera snapper (*Lutjanus cyanopterus*) in southeastern Brazil and its management implications	2022	Habitat Zone*
	Biggs et al.	The importance of spawning behavior in understanding the vulnerability of exploited marine fishes in the U.S. Gulf of Mexico	2021	Eco-region
Gag grouper	Biggs et al.	The importance of spawning behavior in understanding the vulnerability of exploited marine fishes in the U.S. Gulf of Mexico	2021	Adult Eco-region, season
	Lowerre-Barbieri et al.	Testing assumptions about sex change and spatial management in the protogynous gag grouper, *Mycteroperca microlepis*	2020	Growth/Recruitment
	Fodrie et al.	Determinants of the nursery role of seagrass meadows in the sub-tropical Gulf of Mexico: inshore-offshore connectivity for snapper and grouper	2020	Juvenile Eco-region, habitat zone, habitat type
	Munnely et al.	Spatial and Temporal Influences of Nearshore Hydrography on Fish Assemblages Associated with Energy Platforms in the Northern Gulf of Mexico	2021	Juvenile Eco-region
	Alvarez	Using Video Surveys to Examine the Effect of Habitat on Gag Occurrence	2020	Eco-region, Habitat type
Goldface tilefish				

Goliath grouper	Orth	"Fish, Fishing, and Conservation"; CH 13 Grouper and Spawning Aggregations	2023	SA Season
Gray snapper	Anderson et al.	Distribution, Maturity, Age and Growth of Gray Snapper (Lutjanus griseus) in the Northwestern Gulf of Mexico	2022	Adult Habitat Zone
Gray triggerfish				
Greater amberjack	Gallaway et al.	Absolute Abundance Estimates for Red Snapper, Greater Amberjack, and Other Federally Managed Fish on Offshore Petroleum Platforms in the Gulf of Mexico	2021	Habitat Association-artificial reef
Hogfish	Faletti and Stallings	Life history through the eyes of a hogfish: trophic growth and differential juvenile habitat use from stable isotope analysis	2021	Habitat Zone, Depth
	Towne et al.	Habitat specific tradeoffs in growth and survival by hogfish *Lachnolaimus maximus* in southeast Florida	2021	Adult Eco-region
Lane snapper	Fernandes et al.*	Reproductive biology of the lane snapper, *Lutjanus synagris* (Linnaeus 1758) (Perciformes, Lutjanidae), in the Maranhão continental shelf, Northeast of Brazil	2022	Adult and SA growth*, SA season
	Trejo-martinez et al.	Reproductive Strategy of a Continental Shelf Lane Snapper Population from the Southern Gulf of Mexico	2021	SA season, eco-region, habitat zone, habitat type
Lesser amberjack				
Mutton snapper				
Queen snapper	Williams et al.*	Prey diversity in the deep ocean: metabarcoding feeding ecology of the commercially important queen snapper in the US Caribbean	2024	Adult prey*
	Overly *	Mapping queen snapper (*Etelis oculatus*) suitable habitat in Puerto Rico using ensemble species distribution modeling	2024	EFH *
Red grouper		SEDAR 61	2019	Mortality
Red snapper		SEDAR 74	2024	Adult growth, SA season and depth
	Dance et al.	Importance of low-relief nursery habitat for reef fishes	2021	EJ, LJ and Adult Habitat Type,
	Schluze et al.	Artificial Reefs in the Northern Gulf of Mexico: Community Ecology Amid the "Ocean Sprawl"	2020	EFH *
Scamp		SEDAR 60 OA	2022	Adult Mortality and Growth
Silk snapper				
Snowy grouper				
Speckled hind				
Tilefish				
Vermillion Snapper		SEDAR 67	2020	Adult Mortality and Growth
Warsaw Grouper	Sanchez and Rooker	Age, growth, and mortality of threatened Warsaw grouper, *Hyporthodus nigritus*, in the Gulf of Mexico	2021	Adult Mortality and Growth

Wenchman		SEDAR 49	2016	Adult Mortality
Yellowedge grouper		SEDAR 85	2023	Adult Growth, SA season, depth and temperature
Yellowfin grouper				
Yellowmouth grouper		SEDAR 68	2021	Adult growth
Yellowtail snapper		SEDAR 64	2020	Adult Mortality and growth
Coastal Migratory Pelagics FMP				
King mackerel	Banks et al.	Age, growth, and mortality of King Mackerel in the western Gulf of Mexico	2024	SA growth
		SEDAR 38	2014	Eco-region, SA growth
	Huynh et al.	Comparisons of mean length-based mortality estimators and age-structured models for six southeastern US stocks	2019	Mortality
Cobia	Gallaway et al.	Absolute Abundance Estimates for Red Snapper, Greater Amberjack, and Other Federally Managed Fish on Offshore Petroleum Platforms in the Gulf of Mexico	2021	Eco-Region
Spanish Mackerel		SEDAR 81	2023	Adult Mortality and Growth. EJ and LJ Habitat Type
Shrimp FMP				
Brown shrimp	Glover et al.	Juvenile Brown Shrimp (*Farfantepenaeus aztecus*) Use of Salt Marsh Intertidal Creeks as Nursery Habitat	2023	Habitat Type
	Pickens et al.	Predicting the Distribution of Penaeid Shrimp Reveals Linkages Between Estuarine and Offshore Marine Habitats.	2021	Eco-region, habitat zone
Pink shrimp	Pickens et al.	Predicting the Distribution of Penaeid Shrimp Reveals Linkages Between Estuarine and Offshore Marine Habitats	2021	Eco-region, Habitat Zone, Habitat Type
Royal red shrimp				
White shrimp	Cebrian et al.	Comparing Shallow Seagrass Versus Fringing Marsh Habitat Use by Nekton Juvenile Recruits with "Incomparable" Fishing Gear in the Northern Gulf of Mexico	2024	Habitat Type, Eco-region
Red Drum FMP				
Red drum				
Spiny Lobster				
Spiny lobster				

** indicates study was conducted outside of the Gulf.*

Early Juvenile (EJ), Late Juvenile (LJ), and Spawning Adult (SA).

2.1.2 Discussion

Alternative 1 would retain the current description and identification of EFH in all Gulf FMPs as adopted in Generic Amendment 3 (GMFMC 2005). The methodology used to currently describe EFH associates species life history tables with maps of known benthic characteristics. Originally, benthic habitat maps were informed through the NOAA Atlas (NOAA 1985). These

data used to construct the NOAA Atlas were collected in 1985 and it is highly likely that living (i.e seagrass, mangrove, etc.) habitat characterizations in the Gulf has since changed; making the 1985 version of the NOAA Atlas outdated. Incorporating new research study findings, along with updating the information used to construct habitat maps, will improve EFH identification and descriptions. This new information will more accurately identify and describe EFH relative to the current descriptions published in Generic Amendment 3 (GMFMC 2005). At present, there is no life stage-specific EFH maps defined in the FMPs for any of the federally managed species.

Alternative 2 would retain the current methodological approach to identifying and describing EFH as discussed for **Alternative 1** but would update the benthic spatial data sources for constructing habitat maps from the 1985 NOAA Atlas. More recently developed Level 1 EFH maps and text descriptions would be used to identify EFH for species across 7 life stages, when data are available, utilizing additional spatial data acquired state and federal agencies during the 2023/2024 Council contracted work (Appendix B). Additionally, **Alternative 2** would incorporate more contemporary research literature into species life history and habitat association tables. Updates to these tables have been conducted during the periodic 5-year review process but are not currently incorporated in the various Gulf FMPs. The literature reviewed conducted and subsequently used to modify EFH in **Alternative 2** includes research published through 2024. Under **Alternative 2**, species EFH maps and text descriptions by life stage would be implemented into the Gulf FMPs for the first time, substantially improving the scientific information available for species-specific EFH descriptions. Updated EFH text and map descriptions under **Alternative 2** would include more robust species-specific information to enhancing conservation benefits to the stock. Methods outlined in **Alternative 2** could be readily updated as required, and as more data became available to inform species-specific habitat preferences, the maps could be easily refined.

CHAPTER 3. EFH DESCRIPTIONS AND IDENTIFICATION

As part of the 2025 EFH 5-year review, species profiles were created for most species managed by the Council, apart from Corals. New information collected from literature reviews (Table 2.1.1) are added to the information collected during previous reviews (GMFMC 2010 and GMFMC 2016) in the habitat association synopsized by life stage (Appendix A). Throughout the species profiles, eco-regions (ER), identified in the EFH FEIS (GMFMC 2004) are referenced, as described in Table 3.1.1. and visualized in Figure 3.1.1.

Table 3.1.1. Gulf eco-regions and the corresponding NOAA Statistical (Stat) Grids.

Eco-region Name	Bounds	NOAA Stat Grid
1. South Florida	Florida Keys to Tarpon Springs	1-5
2. North Florida	Tarpon Springs to Pensacola Bay	6-9
3. East Louisiana, Mississippi, and Alabama	Pensacola Bay to the Mississippi Delta	10-12
4. East Texas and West Louisiana	Mississippi Delta to Freeport Texas	13-18
5. West Texas	Freeport, Texas to the Mexican border	19-21

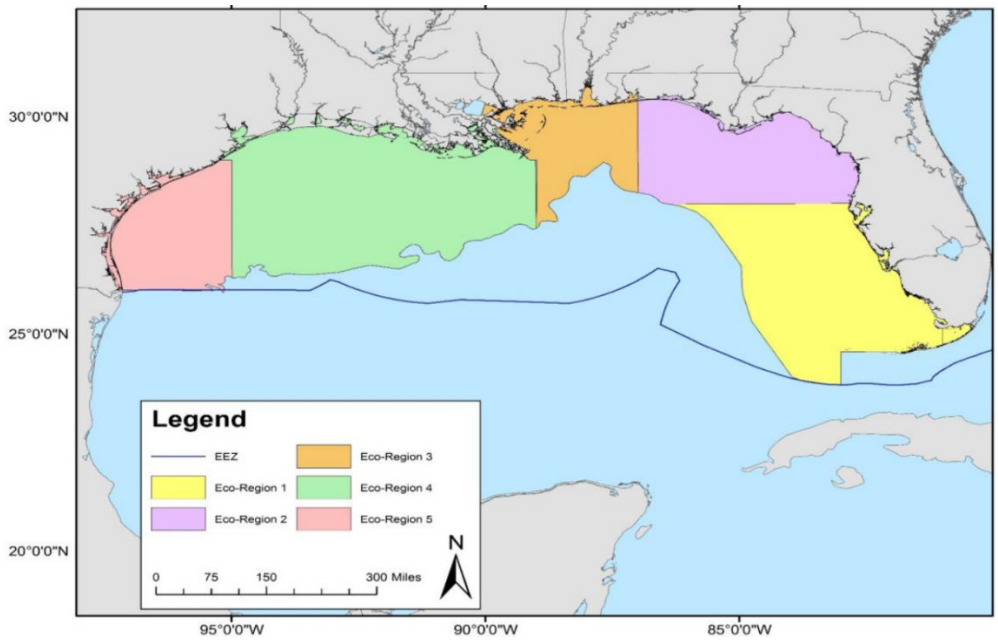

Figure 3.1.1 Map of eco-regions textually described in the table above and referenced in the habitat association tables.

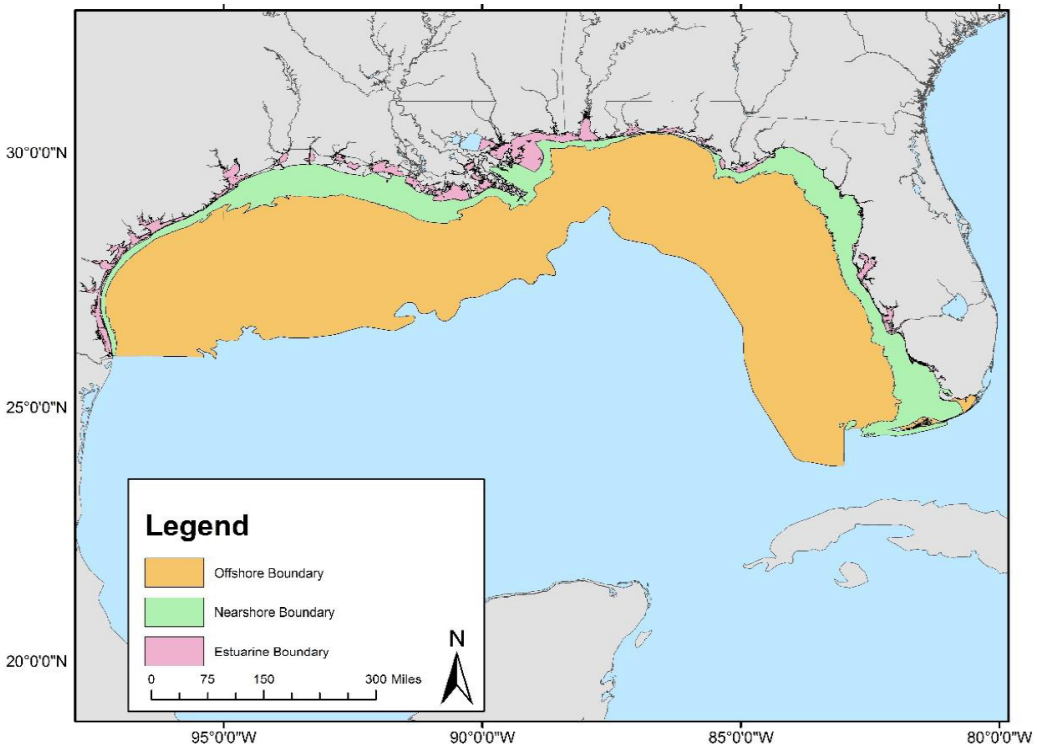

Figure 3.1.2 Spatial depiction of Gulf habitat zones: estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth).

Habitat zone is comprised of three categories: estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth) and offshore (greater than 60 feet (18m) in depth; Figure 3.1.2). Habitat type is then subdivided into 12 categories distributed amongst the three

zones. Table 3.1.2 summarized the 12 habitat types used throughout species profiles and are based on a combination of substrate and biogenic structure descriptions that are considered to provide the best overall categorization of fish habitats in the Gulf, defined in the Final EFH EIS (GMFMC 2004). In the estuarine component, EFH encompasses all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), including the sub-tidal vegetation (seagrasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves). In marine waters (nearshore and offshore), EFH encompasses all marine waters and substrates (mud, sand, shell, rock, hard bottom, and associated biological communities) from the shoreline to the seaward limit of the exclusive economic zone (EEZ).

Table 3.1.2. Twelve habitat types used throughout the species profiles and terms related to those habitat types.

Habitat Type	Related Terms
Submerged Aquatic Vegetation (SAV)	Seagrasses, benthic algae
Mangroves	N/A
Drifting algae	*Sargassum*
Emergent marshes	Tidal wetlands, salt marshes, tidal creeks, rivers/streams
Sand/shell bottoms	Sand
Soft bottoms	Mud, clay, silt
Hard bottoms	Hard bottoms, live hard bottoms, low-relief irregular bottoms, high-relief irregular bottoms
Oyster reefs	N/A
Banks/shoals	N/A
Reefs	Reefs, reef halos, patch reefs, deep reefs
Shelf edge/slope	Shelf edge, shelf slope
Water Column Associated (WCA)	Pelagic, planktonic, coastal pelagic

Currently, EFH is defined by FMP broadly (Generic Amendment 3, 2005), and is not defined by species or life stage. The current definitions in the FMP are defined below:

Red Drum: all estuaries; Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 25 fathoms (150 feet, 46 m); Crystal River, Florida, to Naples, Florida, between depths of 5 and 10 fathoms (30-60 feet, 9-18 m); and Cape Sable, Florida, to the boundary between the areas covered by the GMFMC and the South Atlantic Fishery Management Council between depths of 5 and 10 fathoms (30-60 feet, 9-18 m).

Reef Fish and CMP FMPs: all estuaries; the US/Mexico border to the boundary between the areas covered by the Gulf and South Atlantic Councils from estuarine waters out to depths of 100 fathoms (600 feet, 182 m).

Shrimp FMP: all estuaries; the US/Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 100 fathoms (600 feet, 182 m); Grand Isle, Louisiana, to Pensacola Bay, Florida, between depths of 100 and 325 fathoms (600-1950 feet, 182-594 m); Pensacola Bay, Florida, to the boundary between the areas covered by the Gulf and South Atlantic Fishery

Management Councils to depths of 35 fathoms (210 feet, 64 m), with the exception of waters extending from Crystal River, Florida, to Naples, Florida, between depths of 10 and 25 fathoms (60-150 feet, and in Florida Bay between depths of 5 and 10 fathoms (30-60 feet, 9-18 m).

Spiny Lobster FMP: from Tarpon Springs, Florida, to Naples, Florida, between depths of 5 and 10 fathoms; and Cape Sable, Florida, to the boundary between the areas covered by the Gulf and South Atlantic Councils out to depths of 15 fathoms (90 feet, 27 m).

3.1 EFH Text and Map Descriptions

In the 2025 EFH 5-year review, Level 1, where distribution data are available for some or all portions of the geographic range of the species, EFH maps and text descriptions for species by life stage were compiled using updated literature to inform habitat associations and updated metadata provided by the Gulf states (Appendix B). To create these maps, eco-region (Figure 3.1.1) and habitat zone (Figure 3.1.2) are used to clip the GIS information gathered for each habitat type (Table 1.1.2). No spatial data currently exist to inform drifting algae and banks/shoals habitat type. As such, those habitat types were not used in creating EFH Level 1 species maps, but are included in the EFH textual definitions and habitat attribute tables. For those species life stages without information to inform an EFH map, they are left blank and noted "No information is available". Currently maps can be viewed at: https://gulfcouncilportal.shinyapps.io/EFH_5_year_Review_2025/.

Additionally, EFH text descriptions (Section 3.1.1) were refined using updated literature through 2024 to describe EFH by eco-region (Table 3.1.1), habitat zone (estuarine, nearshore, and offshore), and habitat type (Table 3.1.2). Should the Council select **Alternative 2**, the following EFH text definitions would be adopted into the FMP for official use. The updated EFH text identification and descriptions would provide the most up to date information on species-specific habitat associations to better enhance conservation of the stock, and be referenced in management, specific to EFH consultations.

3.1.1 Reef Fish

Almaco Jack

Almaco jack occur throughout the Gulf. Adults are benthopelagic and form small groups. Juveniles are frequently associated with floating objects, and eggs are water column associated.

Egg: Information is not available.

Larvae: Information is not available.

Post larvae: Information is not available.

Early juvenile: Gulf-wide (ER 1-5) in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column and drifting algae (*Sargassum*).

Late juvenile: Gulf-wide (ER 1-5) in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column and drifting algae (*Sargassum*).

Adult: Gulf-wide (ER 1-5) in offshore (greater than 60 feet [18m] in depth) habitats associated with the shelf edge, hard bottom substrate including banks and reefs.

Spawning adult: Gulf-wide (ER 1-5) in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the shelf edge, hard bottom substrate including banks and reefs.

Banded Rudderfish

Banded rudderfish are broadly distributed in the eastern portion of the Gulf, and spawn in offshore waters of the eastern Gulf, the Yucatan Channel and Straits of Florida. Banded rudderfish are pelagic or epibenthic and confined to coastal waters over the continental shelf where they feed on fish and shrimps.

Egg: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Larvae: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Post larvae: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column and drifting algae (*Sargassum*).

Early juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column and drifting algae (*Sargassum*).

Late juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column and drifting algae (*Sargassum*).

Adult: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Spawning adult: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with the water column. Spawning may occur in winter-spring and fall.

Blackfin snapper

Blackfin snapper are most concentrated in the eastern Gulf, off the West coast of Florida. Blackfin snapper tend to occupy the shelf edge habitats (40-300m), where they feed on fish and crustaceans.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Larvae: Information is not available.

Post larvae: Information is not available.

Early juvenile: ER 1 and ER 2 in in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with hard bottom.

Late juvenile: ER 1 and ER 2 in in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with hard bottom.

Adult: ER 1 and ER 2 in in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with hard bottom, shelf/slope edge, and sandy bottom.

Spawning adult: ER 1 and ER 2 in in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats associated with hard bottom, shelf/slope edge.

Black grouper

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth), most concentrated between 18-28m, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Post larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitats associated with the water column.

Early juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet (18m) or less in depth), concentrated between 1-10m associated with submerged aquatic vegetation (SAV)

Late juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) concentrated between 10-19m associated with reefs, hard bottom habitat and mangroves.

Adult: ER 1 and ER 2 in nearshore (60 feet (18m) or less in depth) and offshore (greater than 60 feet [18m] in depth) likely between 10-150m associated with reefs and hard bottom habitat.

Spawning adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) likely between 18-28 associated with reefs, hard bottom, and the shelf/slope edge.

Blueline tilefish

Blueline tilefish are distributed mainly on the eastern/southeastern Gulf and the Campeche Yucatan outer continental shelf, shelf edge and upper slope. Blueline tilefish are found over irregular bottom, including troughs and terraces, sand, mud and rubble, and shell hash, and may be associated with goldface tilefish and blackline tilefish.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Post larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Early juvenile: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Late juvenile: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 60-256m, and known to burrow at depths of 91-150m, and are associated with hard bottom, soft bottom, the shelf/edge, and sand/shell substrate.

Spawning adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the shelf/edge slope.

Cubera snapper

Cubera Snapper are distributed mainly on the eastern/southeastern Gulf found in both shallow and deep reefs, wrecks (to at least 85 m deep), and in mangroves. Two spawning sites have been recorded in the eastern Gulf: both wrecks located in 67-85 m of water, off Key West and the Dry Tortugas.

Egg: ER 1 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-85m, associated with the water column.

Larvae: ER 1 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-85m, associated with the water column.

Post larvae: ER 1 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-85m, associated with the water column.

Early juvenile: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-85m, associated with submerged aquatic vegetation, mangroves and emergent marsh.

Late juvenile: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-85m, associated with submerged aquatic vegetation, mangroves and emergent marsh.

Adult: ER 1 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, >85m, associated with mangroves and reef habitats.

Spawning adult: ER 1in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, >85m, associated with reefs, shelf/slope edge, hardbottom, and banks/shoals.

Gag grouper

Gag are demersal and most common in the eastern Gulf, especially the west Florida shelf. Adults occupy hard bottom substrates, including offshore reefs and wrecks, coral and live bottoms, and depressions and ledges. Spawning adults form aggregations in depths of 50-120m, with the densest aggregations occurring around the Big Bend area of Florida. Spawning occurs near the shelf edge break from December to May with a peak in the early spring (February-March) on the west Florida shelf. Madison-Swanson is a 298 square km (115 square mile) area, south of Panama City, Florida, containing high-relief hard bottom habitat, and is a known spawning ground for gag. Eggs are pelagic, occurring from December to April, with areas of greatest abundance offshore on the west Florida shelf. Larvae are pelagic and are most abundant in the early spring. Post-larvae and pelagic juveniles move through inlets into coastal lagoons and high salinity estuaries from April through May where they become benthic and settle into grass flats and oyster beds. Late juveniles move offshore in the fall to shallow reef habitat in depths of one to 50m.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 50-120m, during winter and spring, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 50-120m, during spring, and are associated with the water column.

Post larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 50-120m, and are associated with the water column.

Early juvenile: ER 1, ER 2 and ER 3, in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats, concentrated between 0-12m, associated with submerged aquatic vegetation and mangroves.

Late juvenile: ER 1, ER 2, ER 3, and ER 4, in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, associated with submerged aquatic vegetation, hard bottom, reefs and mangroves.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 13-100m, associated with hard bottom and reefs.

Spawning adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 50-120m, associated with the shelf/slope edge and hard bottom.

Goldface tilefish

Very little is known on habitat usage and distribution of goldface tilefish, but adults are thought to be distributed along the eastern Gulf, Florida Panhandle, and along the Alabama and Louisiana Coast.

Egg: Information is not available.

Larvae: Information is not available.

Post larvae: Information is not available.

Early juvenile: Information is not available.

Late juvenile: Information is not available.

Adult: ER 2 and ER 3 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with shelf/slope edge and soft bottom.

Spawning adult: Information is not available.

Goliath Grouper

Goliath grouper are in the shallow waters of the eastern Gulf, and are most abundant on the southwest Florida. Younger adults are found inshore around docks, bridges and jetties, and reef crevices, while large adults prefer offshore ledges and wrecks. The species depth range in the Gulf is to 95m, with the highest abundance at 2-55m. Early juveniles are found in bays and estuaries, inshore grass beds, canals, and mangroves. Larger juveniles are also found around ledges, reefs, and holes in shallow waters. Spawning occurs off southeast and southwest Florida, and other parts of the Gulf around offshore structures, wrecks and patch reefs (i.e. high-relief structures) at depths of 36-46m from June-December, with peaks in July and September.

Egg: ER 1 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 36-46m, and are associated with the water column.

Larvae: ER 1 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 36-46m, and are associated with the water column.

Post larvae: ER 1 and ER 5 in nearshore (60 feet [18m] or less in depth) habitat and are associated with mangroves.

Early juvenile: ER 1 and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats, and are associated with mangroves, submerged aquatic vegetation, and emergent marsh.

Late juvenile: ER 1 and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats, and are associated with mangroves, submerged aquatic vegetation, emergent marsh, reefs, and hard bottom substrate.

Adult: ER 1 and ER 5 in nearshore (60 feet [18m] or less in depth) and habitats, and offshore (greater than 60 feet [18m] in depth) and are associated with reefs, hard bottom, and shoals/banks.

Spawning adult: ER 1 and ER 5 in nearshore (60 feet [18m] or less in depth) and habitats, and offshore (greater than 60 feet [18m] in depth) and are associated with reefs, and hard bottom substrate.

Gray snapper

Gray snapper occur in estuaries and shelf waters of the Gulf, and are particularly abundant in the Eastern Gulf off of southwest Florida. Gray snapper inhabits waters to depths of about 180 m and are found in mangroves, sandy grass beds, reef, and over sandy, muddy, and rocky bottoms.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 0-180m, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated between 0-180m, and are associated with the water column.

Post larvae: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) habitat and are associated with submerged aquatic vegetation.

Early juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) habitat, and are associated with submerged aquatic vegetation, mangroves, and emergent marsh.

Late juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and in nearshore (60 feet [18m] or less in depth) habitats, and are associated with submerged aquatic vegetation, mangroves, and emergent marsh.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 1-180m, and are associated with submerged aquatic vegetation, mangroves, emergent marsh, reefs, banks/shoals, and sand/shell substrate.

Spawning adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 1-180m, and are associated with reefs and banks/shoals.

Gray triggerfish

Gray triggerfish are found Gulf-wide in all eco-regions at depths from 10-100 m; they occupy habitat types including the water column, reefs, drifting algae(*Sargassum)*.

Egg: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-100m, and are associated with reefs..

Larvae: Gulf-wide ER 1-5 and are associated with the water column and associated with drifting algae.

Post larvae: Gulf-wide ER 1-5 and are associated with the water column and associated with drifting algae.

Early juvenile: Gulf-wide ER 1-5 and are associated with drifting algae.

Late juvenile: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-100m, and are associated with reefs and drifting algae.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-100m, and are associated with reefs.

Spawning adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated between 10-100m, and are associated with reefs.

Greater amberjack

Greater amberjack are found Gulf-wide, primarily offshore and have been documented in depths up to 187 m. All life stages can be water column associated, whereas late juveniles and adults are associated with hard bottom, and adults and spawning adults have been documented on reefs.

Egg: Gulf-wide ER 1-5 and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Post larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Early juvenile: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Late juvenile: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column and hard bottom.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths <187m, and are associated with the water column, hard bottom, reefs, and banks/shoals.

Spawning adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column and reefs.

Hogfish

Hogfish are generally distributed in the Eastern Gulf along the west coast of Florida. Juveniles can be found in shallow seagrass beds in Florida Bay and adults are widely distributed on coral reefs and rocky flats.

Egg: ER 1 and ER 2 and are associated with the water column.

Larvae: ER 1 and ER 2 and are associated with the water column.

Post larvae: ER 1 and ER 2 and are associated with the water column.

Early juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and in nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation and reef habitat.

Late juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and in nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation and reef habitat.

Adult: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and in nearshore (60 feet [18m] or less in depth) habitats and are associated with hard bottom and reefs habitat.

Spawning adult: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and in nearshore (60 feet [18m] or less in depth) habitats, and are associated with reefs, sand, and hard bottom habitat.

Lane snapper

Lane snapper can be found Gulf-wide in most habitat zones. Juveniles and adults are found across most habitat types including submerged aquatic vegetation, sand/shell, reefs, soft bottom, banks/shoals, and mangroves. Adults occupy nearshore and offshore waters, at depths from 4-132 m and temperature of 16-29°C.

Egg: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 4-132m, and are associated with the water column.

Larvae: Gulf- wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Post larvae: Gulf- wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column and submerged aquatic vegetation habitat.

Early juvenile: Gulf- wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats. Associated habitat types are: submerged aquatic vegetation, sand/shell substrate, reefs, soft bottom, banks/shoals, and mangroves.

Late juvenile: Gulf- wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats. Associated habitat types are: submerged aquatic vegetation, sand/shell substrate, reefs, soft bottom, banks/shoals, and mangroves.

Adult: Gulf- wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with sand/shell substrate and banks/shoals habitat.

Spawning adult: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with reef and shelf edge/slope habitat.

Lesser amberjack

Lesser amberjack are found Gulf-wide in all eco-regions, but primarily are found in offshore waters. Depending on life stage, they occupy drifting algae, hard bottom, or reef habitats, in depths of 55-348m.

Egg: Information is not available.

Larvae: Information is not available.

Post larvae: Information is not available.

Early juvenile: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associate with drifting algae.

Late juvenile: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats and are associated with hard bottom and reef habitats.

Adult: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats and are associated with hard bottom and reef habitats.

Spawning adult: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats and are associated with hard bottom and reef habitats.

Mutton snapper

Mutton snapper occur in ER-1 and use primarily reef and submerged aquatic vegetation habitats depending on life stage, however spawning adults can be found on banks/shoals, hard bottom, and shelf edge/slope as well.

Egg: ER 1 and are associated with the water column.

Larvae: ER 1 and are associated with the water column.

Post larvae: ER 1 and are associated with the water column.

Early juvenile: ER 1 and are associated with the water column.

Late juvenile: ER 1 and are associated with the water column.

Adult: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation and reef habitat.

Spawning adult: ER 1 offshore (greater than 60 feet [18m] in depth) habitat, and are associated with reef, banks/shoals, hard bottom, and shelf edge/ slope habitats.

Queen snapper

Queen snapper are found in the southeastern Gulf along the West Coast of Florida. Pre-settlement life stages are water column associated and are most prevalent from 0-100 m, based on research in the Straits of Florida. Queen snapper settle to hard bottom, and data from the Caribbean suggests that adults also use shelf edge/slope habitat. Adult and spawning adult depth range is from 95-680m.

Egg: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Post larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Early juvenile: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Late juvenile: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Adult: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with hard bottom and shelf edge/slope habitat.

Spawning adult: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Red grouper

Reg grouper in the Gulf are found in the eastern portion of the Gulf, in nearshore and offshore waters from 0 - 100 m, and at temperatures from 15 - 30°C. Early life stages are water column associated, and juveniles settle on submerged aquatic vegetation and hard bottom habitats. Red grouper move offshore with growth, and onto reefs and hard bottom. Adults have been documented spawning over hard bottom and shelf edge/slope habitats.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-100m, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, and are associated with the water column.

Post larvae: ER 1 and ER 2 and are associated with the water column.

Early juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) habitat and are associated with submerged aquatic vegetation and hard bottom habitats.

Late juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, and are associated with hard bottom habitats.

Adult: ER 1, ER 2, ER 3, and ER 4 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with hard bottom and reef habitats.

Spawning adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with shelf edge/slope and hard bottom habitats.

Red snapper

Red snapper occur Gulf-wide along the shelf. They are historically abundant on the Campeche Banks and are a predominate species in the northern Gulf. The species is demersal and is found over sandy and rocky bottoms, around reefs, and artificial habitats from shallow water to 200 m, and possibly even beyond 1200 m. Spawning occurs in offshore waters from May to October at depths of 18 to 37 m over fine sand bottom. Eggs are found offshore in summer and fall. Larvae, post larvae and early juveniles are found July through December in shelf waters ranging in depth of 17-183m. Early and late juveniles are most often associated with shell and low relief structures but can be observed over barren sand and mud bottom. Late juveniles are found year-round at depths of 20 to 46 m. Adults are concentrated off Yucatan, Texas, and Louisiana at depths of 7 to 146 m and are most abundant at depths of 40-110m. They are commonly relying on habitat such as: submarine gullies and depressions, and over coral reefs, rock outcroppings, and shell/gravel bottoms.

Egg: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-126m, and are associated with the water column.

Larvae: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-126m, and are associated with the water column.

Post larvae: Gulf- wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-126m, and are associated with the water column.

Early juvenile: Gulf- wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 17-183m. Associated habitat types are: hard bottom, banks/shoals, soft bottom, sand/shell substrate, shelf edge/slope.

Late juvenile: Gulf- wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 17-183m. Associated habitat types are: hard bottom, banks/shoals, soft bottom, sand/shell substrate, shelf edge/slope.

Adult: Gulf- wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 17-183m. Associated habitat types are: hard bottom, banks/shoals, reefs, shelf edge/slope.

Spawning adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 17-183m, and are associated with sandy/shell substrate and banks/shoals.

Scamp

Scamp widely distributed throughout shelf areas of the Gulf, predominately off the west coast of Florida, and are found in both nearshore and offshore waters from depths of 12-189m. Adults use hard bottom and reef habitats and spawn on the shelf edge/slope, reef or hard bottom habitats, and early life stages are found in the water column.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 60-189m, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 60-189m, and are associated with the water column.

Post larvae: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 60-189m, and are associated with the water column.

Early juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with reef and hard bottom habitats.

Late juvenile: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with reef and hard bottom habitats.

Adult: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 12-189m,and are associated with reef and hard bottom habitats.

Spawning adult: ER 1, ER 2, ER 3, and ER 4 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths 60-189m, and are associated with the shelf edge/slope, reef, and hard bottom habitats.

Silk snapper

Silk Snapper are distributed along the Southeastern portion of the Gulf, along the west coast of Florida. Silk snapper is a deeper water species that occupies offshore waters and are found near the edge of continental and island shelves, usually ascending to shallower waters at night. It is common between 90-140m but can be found in waters ~200m. Very little habitat information is known about life stages other than adults.

Egg: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Post larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Early juvenile: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Late juvenile: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Adult: ER 1 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths 90-200m, and are associated with the shelf edge/slope, soft bottom, and hard bottom habitats.

Spawning adult: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Snowy grouper

Snowy grouper are found in largest numbers in deep waters off of South Florida and the northwestern coast of Cuba. Adults commonly occur on hard bottoms and reefs (particularly Florida *Oculina* reefs) in waters with depths from 30-525 m and are often found with other deep-water species such as yellowedge grouper and tilefishes.

Eggs: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 30-525m, and are associated with the water column.

Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 30-525m, and are associated with the water column.

Post Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 30-525m, and are associated with the water column.

Early Juveniles: ER 1 in nearshore (60 feet [18m] or less in depth) habitat, depth <1m, and are associated with reef habitat.

Late Juvenile: ER 1 in nearshore (60 feet [18m] or less in depth) habitat, depth <1m, and are associated with reef habitat.

Adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 30-525m, and are associated with the shelf edge/slope, hard bottom, and reef habitat.

Spawning Adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 30-525m, and are associated with the shelf edge/slope and reef habitat.

Speckled hind

Speckled hind is a deep-water grouper distributed in the north and eastern Gulf on offshore hard bottom habitats, including rocky bottoms, and both high- and low-profile hard bottoms. Speckled hind occur between 25-183 m and are most common at 60-120 m depth. Juveniles are most commonly found in the shallow portion of the depth range.

Egg: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-183m, and are associated with the water column.

Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-183m, and are associated with the water column.

Post Larvae: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-183m, and are associated with the water column.

Early Juvenile: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 25-183m, and are associated with reef habitat.

Late Juvenile: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 25-183m, and are associated with reef habitat.

Adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 25-183m, and are associated with hard bottom habitat.

Spawning Adult: ER 1 and ER 2 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 44-183m, and are associated with the shelf edge/slope.

Tilefish

Tilefish occur throughout the deeper waters of the Gulf. The species is demersal, occurring at depths from 80-450 m, but is most commonly found between depths of 250-350 m. Preferred habitats are soft bottom (particularly malleable clay), on the shelf edge/slope. Eggs and larvae are pelagic; early juveniles recruit to benthic habitats with age. Late juveniles burrow and occupy shafts in the substrate. Adults also burrow along the outer continental shelf and on flanks of submarine canyons.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with the water column.

Post Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with the water column.

Early Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with the water column.

Late Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with shelf edge/slope, and soft bottom habitat.

Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with shelf edge/slope, and soft bottom habitat.

Spawning Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-450m, and are associated with shelf edge/slope, and soft bottom habitat.

Vermillion snapper

Vermilion snapper are found throughout the shelf areas of the Gulf. The species is demersal, occurring over reefs and rocky bottom from depths of 18 to 100 m. Spawning occurs from May to September in offshore waters.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Post Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the water column.

Early Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-100mm, and are associated with hard bottom and reef habitat.

Late Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-100mm, and are associated with hard bottom and reef habitat.

Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 18-100mm, and are associated with banks/shoals, hard bottom and reef habitat.

Spawning Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat.

Warsaw grouper

Warsaw grouper are a deep-water species distributed throughout the Gulf, in association with hard bottoms. They occur from 40-525 m, more commonly down to 250 m, and prefer rough, rocky bottoms with high profiles such as steep cliffs and rocky ledges.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-525m, and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-525m, and are associated with the water column.

Post Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-525m, and are associated with the water column.

Early Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat.

Late Juvenile: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths >200m, and are associated with reef habitat.

Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-525m, and are associated with the shelf edge/slope and hard bottom habitat.

Spawning Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 40-525m, and are associated with the shelf edge/slope and hard bottom habitat.

Wenchman

Wenchman are concentrated on the western portion of the Gulf and occupy hard bottom habitats of the mid to outer shelf where they feed mainly on small fish; they are found at depths ranging from 19-481m, but are most abundant between 80-200m.

Egg: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-200m, and are associated with the water column.

Larvae: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-200m, and are associated with the water column.

Post Larvae: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth).

Early Juvenile: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth).

Late Juvenile: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth).

Adult: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 19-481m, and are associated with shelf edge/slope and hard bottom habitat.

Spawning Adult: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 80-200m, and are associated with the shelf edge/slope.

Yellowedge grouper

Yellowedge grouper are a deep water species found throughout the Gulf continental shelf, with areas of high abundance off of Texas and west Florida. On the outer continental shelf in the eastern Gulf, the species occupies high relief hard bottoms, rocky out-croppings and are often found co-occurring with snowy grouper and tilefish. In the central and western Gulf, adult yellowedge grouper occupy hard bottom where available, but also burrow in soft bottom habitat. The species depth range is from 35-370m with adults most common in waters greater than 180 m deep. Juveniles occupy a shallower depth range of 9-110m.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 35-370m, and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 35-370m, and are associated with the water column.

Post Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 35-370m, and are associated with the water column.

Early Juvenile: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 9-110m.

Late Juvenile: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths between 9-110m, and are associated with hard bottom habitat.

Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 35-370m, and are associated with the shelf edge/slope, hard bottom, and soft bottom habitat.

Spawning Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 35-370m, and are associated with the shelf edge/slope and reef habitat.

Yellowfin grouper

Yellowfin grouper is not common in the Gulf, occurring primarily in the southeastern Gulf and West Indies. Habitat is comprised of rocky bottoms and coral reefs from the shoreline to mid-shelf depths. Juveniles occupy shallow seagrass beds and move to deeper rocky bottoms with growth.

Egg: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Post Larvae: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat.

Early Juvenile: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation.

Late Juvenile: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation and hard bottom habitat.

Adult: ER 1 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with reef and hard bottom habitat.

Spawning Adult: ER 1 in offshore (greater than 60 feet [18m] in depth) habitat and are associated with the shelf edge/slope, reef, and hard bottom habitat.

Yellowmouth grouper

Yellowmouth grouper occur off of the Campeche Banks, the west coast of Florida, Texas Flower Garden Banks National Marine Sanctuary, and the northwest coast of Cuba. Yellowmouth grouper occupy rocky bottoms and coral reefs, and juveniles commonly occur in mangrove-lined lagoons and move into deeper water as they grow.

Egg: ER 1 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-189m, and are associated with the water column.

Larvae: ER 1 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-189m, and are associated with the water column.

Post Larvae: ER 1 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-189m, and are associated with the water column.

Early Juvenile: ER 1 and ER 5 associated with mangrove habitat.

Late Juvenile: ER 1 and ER 5 associated with mangrove habitat.

Adult: ER 1, ER 2, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-189m, and are associated with banks/shoals, hard bottom, and reef habitat.

Spawning Adult: ER 1, ER 2, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths between 20-189m.

Yellowtail snapper

Yellowtail snapper are distributed throughout the southeastern portion of the Gulf, along the shelf, but are most common off central and southern Florida. This species occurs over hard, irregular bottoms, such as coral reefs and near the edge of shelves and banks. Juveniles are found in nearshore nursery areas over vegetated sandy substrate and in muddy shallow bays (NOAA 1985). Submerged acquatic vegetation, *Thalassia* spp. beds and mangrove roots are apparent preferred habitat for early juveniles. Late juveniles apparently select shallow reef areas as primary habitat. Adults are found from shallow waters to depths of 183 m but generally are taken in less than 50 m depths. Adults are considered to be semi-pelagic wanderers over reef habitat.

Egg: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Larvae: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Post Larvae: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Early Juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation and mangrove habitat.

Late Juvenile: ER 1 and ER 2 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with reef and hard bottom habitat.

Adult: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with reef and hard bottom habitat.

Spawning Adult: ER 1 and ER 2 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats.

3.1.2 Coastal Migratory Pelagics

Cobia

Cobia are found in coastal and offshore waters (from bays and inlets to the continental shelf) from depths of 1-70 m. Spawning occurs in coastal waters from April through September at temperatures ranging from 23-28° C. Cobia migrate seasonally, similar to other coastal pelagic species in the same family. Eggs are found in the top meter of the water column, drifting with the

currents. Larvae are found in surface waters of the northern Gulf, where they likely feed on zooplankton. Juveniles occur in coastal and offshore waters.

Egg: ER 2, ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats concentrated in depths <1m and are associated with the water column.

Larvae: ER 2, ER 3, and ER 4, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Post Larvae: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Early Juvenile: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Late Juvenile: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 1-70m, and are associated with the water column.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 1-70m, and are associated with the water column and banks/shoals.

Spawning Adult: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 1-70m, and are associated with the water column.

King mackerel

King mackerel are widespread throughout the Gulf, with centers of distribution in south Florida and Louisiana. Adults are water column associated and can be found over reefs and in coastal waters, although they rarely enter estuaries. While adults can be found at the shelf edge in depths to 200 m, they generally occur in less than 80 m, at oceanic salinities from 32-36 ppt. Adults spawn over the outer continental shelf from May to October, with the northwestern and northeastern Gulf considered important spawning areas. The pelagic eggs are found offshore over depths of 35-180 m in spring and summer. Larvae occur over the middle and outer continental shelf, principally in the north central and northwestern Gulf, and juveniles are found from inshore to the middle shelf. Migrations to the northern Gulf in the spring are believed to be temperature dependent, and the species is found in highest abundances in waters with temperatures greater than 20°C.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 35-180m , and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 35-180m , and are associated with the water column.

Post Larvae: Information not available.

Early Juvenile: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Late Juvenile: ER 3, ER 4, and ER 5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Adult: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Spawning Adult: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 35-180m, and are associated with the water column.

Spanish mackerel

Spanish mackerel occur throughout the coastal zones of the western Atlantic from southern New England to the Florida Keys and throughout the Gulf. In the Gulf their distribution is centered off of Florida. Adults are found in coastal waters, and may enter estuaries in pursuit of baitfish. Migrations to the northern Gulf in the spring are temperature dependent, and the species is found in waters greater than 20°C, and out to depths of 75 m at oceanic salinities. Adults spawn over the inner continental shelf from May to September, with the north-central and northeastern Gulf considered important spawning areas. Eggs occur over the inner continental shelf at depths less than 50 m in spring and summer. Larvae occur over the inner continental shelf, principally in the northern Gulf.

Egg: ER 2 and ER 3 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

Larvae: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats concentrated at depths 1-84m, and are associated with the water column.

Post Larvae: Gulf-wide ER 1-5 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats concentrated at depths 1-84m, and are associated with the water column.

Early Juvenile: ER 2 and ER 3 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats concentrated at depths 1.8-9m, and are associated with the water column and sandy bottom habitat.

Late Juvenile: ER 2 and ER 3 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats concentrated at depths 1.8-50m, and are associated with the water column and sandy bottom habitat.

Adult: ER 1, ER 2 and ER 3 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats concentrated at depths 3-75m, and are associated with the water column.

Spawning Adult: ER 2 and ER 3 in nearshore (60 feet [18m] or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats and are associated with the water column.

3.1.3 Shrimp

Brown shrimp

Brown shrimp are found within estuaries to offshore depths of 110 m in the Gulf, ranging mainly from Apalachicola Bay to the Yucatan Peninsula. Brown shrimp spatial distributions are affected by hypoxia and populations have shown declines with wetland and marsh edge loss.

Fertilized eggs: ER 3, ER 4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between 18-110m, associated with soft bottom, and sand/shell substrate.

Larvae/ Pre-settlement Post larvae: ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between 0-82m, associated with the water column.

Late post larvae/ Early juvenile: ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries) habitats, concentrated in depths <1m, associated with submerged aquatic vegetation, emergent marsh, oyster reef, soft bottom and sand/shell substrate.

Sub Adults (Late Juvenile): ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet (18m) or less in depth) habitats, associated with soft bottom and sand/shell substrate.

Adults: Gulf-wide in ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between 10-37m, associated with soft bottom, mangroves and sand/shell substrate.

Spawning adults: ER 3, ER4, and ER 5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between 18-110m, associated with soft bottom, mangroves and sand/shell substrate.

Pink shrimp

Pink shrimp are widespread throughout the Gulf in estuaries and to depths of 110 m (most abundant less than 50 m) and are the dominant shrimp species off South Florida. Pink shrimp post larvae migrate into the estuaries at night, primarily during the spring and fall, usually on flood tides through passes or open shoreline. Post larval and juvenile pink shrimp are commonly

found in seagrass habitats where they burrow into the substrate by day and emerge to feed at night. Pink shrimp densities are highest in or near seagrasses, low in mangroves, and near zero or absent in marshes. They prefer calcareous-type sediments found most commonly in Florida and sand/shell mud mixtures.

Fertilized eggs: ER 1, ER 2, ER 3 and ER 5 in offshore (greater than 60 feet [18m] in depth) habitats and are associated with sand/shell substrate.

Larvae/ Pre-settlement Post larvae: ER 1, ER 2, ER 3, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between 1-50m, associated with the water column.

Late post larvae/ Early juvenile: ER 1, ER 2, ER 3, and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet (18m) or less in depth) habitats, concentrated in depths 0-3m, associated with submerged aquatic vegetation, soft bottom, mangroves, and sand/shell substrate.

Sub Adults (Late Juvenile): ER 1, ER 2, ER 3, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 1-65m, associated with submerged aquatic vegetation, soft bottom, mangroves, oyster reefs, and sand/shell substrate.

Adults: ER 1, ER 2, ER 3, and ER 5 in nearshore (60 feet (18m) or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 1-110m, associated with submerged aquatic vegetation, mangroves, and sand/shell substrate.

Spawning adults: ER 1, ER 2, ER 3, and ER 5 in nearshore (60 feet (18m) or less in depth) and offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 9-48m, associated with submerged aquatic vegetation, mangroves, and sand/shell substrate.

Royal red shrimp

This species spends its entire life cycle in open Gulf waters, may have up to five year classes occurring together, and lives in a relatively stable environment. In addition, no mature during year the first year (i.e., age 0). Royal red shrimp occupy habitat along the upper continental shelf at depths between 140 and 730 m. Royal red shrimp are less common in depths less than 250 m and greater than 500 m. The highest concentration has been reported in the northeastern part of the Gulf at depths between 250 and 475 m.

Fertilized eggs: ER 1 and ER 3 in offshore (greater than 60 feet [18m] in depth) habitats and are associated with the shelf/slope edge.

Larvae/ Pre-settlement Post larvae: Information not available.

Late post larvae/ Early juvenile: Information not available.

Sub Adults (Late Juvenile): Information not available.

Adults: Gulf-wide ER 1-5 offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 140-750m, associated with the shelf/slope edge, soft bottom, and sand/shell substrate.

Spawning adults: Gulf-wide ER 1-5 offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths 250-550m, associated with the shelf/slope edge.

White shrimp

White shrimp are found in estuaries and out to depths of 40 m (but usually less than 27 m) from Florida's Big Bend through Texas. White shrimp spawn in depths between 9-34 m (but usually less than 27 m) from spring through fall. White shrimp post larvae enter estuaries through passes from May through November with peaks in June and September. White shrimp migration is in the upper two meters of the water column at night and at mid-depths during the day. Post larvae and juveniles inhabit mostly mud and peat bottoms with large amounts of decaying matter or vegetative cover, and they tend to be more active during the day than brown. Sub-adult white shrimp leave estuaries in late August and September on ebb tides during full moons (Whitaker 1982), and the timing appears to be related to shrimp size and environmental conditions (e.g. sharp temperature drops in fall and winter). Adult white shrimp inhabit nearshore Gulf waters to depths less than 30 m on bottoms of soft mud or silt.

Fertilized eggs: ER 2, ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats.

Larvae/ Pre-settlement Post larvae: ER 2, ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats.

Late post larvae/ Early juvenile: ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet (18m) or less in depth) habitats, concentrated in depths <5m, associated with submerged aquatic vegetation, emergent marsh, oyster reef, soft bottom and mangrove habitat.

Sub Adults (Late Juvenile): ER 2, ER 3, ER 4, and ER 5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with soft bottom and sand/shell substrate.

Adults: Gulf-wide in ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitats, concentrated in depths between <27m, associated with soft bottom substrate.

Spawning adults: Gulf-wide in ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet (18m) or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats and are associated with soft bottom and sand/shell substrate.

3.1.4 Red Drum

Red drum

Red drum are distributed throughout the Gulf. Depending on life stage, they are found from estuarine to offshore waters and occur over a variety of habitat types including submerged aquatic vegetation, soft bottom, hard bottom, emergent marsh, sand/shell, and early life stages are water column associated.

Egg: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and is associated with the water column.

Larvae: Gulf-wide ER 1-5 in estuarine (inside barrier islands and estuaries), habitat, concentrated at depths between 18-31m, and are associated with submerged aquatic vegetation, soft bottom substrate and the water column.

Post Larvae: Gulf-wide ER 1-5 in estuarine (inside barrier islands and estuaries) habitat, concentrated at depths between 18-31m, and are associated with submerged aquatic vegetation, emergent marsh, soft bottom and sand/shell substrate.

Early Juvenile: Gulf-wide ER 1-5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation, emergent marsh, and soft bottom substrate.

Late Juvenile: Gulf-wide ER 1-5 in estuarine (inside barrier islands and estuaries) and nearshore (60 feet [18m] or less in depth) habitats and are associated with submerged aquatic vegetation, soft bottom, hard bottom and sand/shell substrate.

Adult: Gulf-wide ER 1-5 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, concentrated at depths 1-70m, and are associated with submerged aquatic vegetation, emergent marsh, soft bottom, hard bottom and sand/shell substrate.

Spawning Adult: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat, concentrated at depths 40-70m, and are associated with submerged aquatic vegetation, soft bottom, hard bottom and sand/shell substrate.

3.1.5 Lobster

Spiny lobster

Spiny Lobster are primarily found along the southwest coast of Florida. The principal habitats used by spiny lobster are offshore coral reefs and seagrasses to depths of 80 m or more with the South Florida Reef Tract appears to be the most important feature for spiny lobster. Areas of high relief on the continental shelf serve as spiny lobster habitat and include coral reefs, artificial reefs, rocky hard bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings.

Phyllosome Larvae: Gulf-wide ER 1-5 in offshore (greater than 60 feet [18m] in depth) habitat and is associated with the water column.

Puerulus postlarvae: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, and are associated with submerged aquatic vegetation and the water column.

Juvenile: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, and are associated with submerged aquatic vegetation, reefs, and hard bottom substrate.

Adult: ER 1 in estuarine (inside barrier islands and estuaries), nearshore (60 feet [18m] or less in depth), and offshore (greater than 60 feet [18m] in depth) habitats, and are associated with submerged aquatic vegetation, reefs, and hard bottom substrate.

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SERO = Southeast Regional Office of the National Marine Fisheries Service.

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APPENDIX A. HABITAT ATTRIBUTE TABLES

A.1 Reef Fish FMP

Almaco jack

Almaco Jack										
Seriola rivoliana										
Lifestage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1,ER-2,ER-5		WCA	spring- fall						
Larvae	ER-1,ER-2,ER-5									
post-Larvae	ER-1,ER-2,ER-5									
Early Juvenile	ER-1,ER-2, ER-3,ER-4,ER-5	nearshore, offshore	drifting algae, WCA	Aug-Jan Jul-Oct	23.3-31.7	6.7-16.8	fish, shrimp, copepods*			
Late Juveniles	ER-1,ER-2, ER-3,ER-4,ER-5	nearshore, offshore	WCA, drifting algae	Aug-Jan Jul-Oct	23.3-31.7	6.7-16.8	fish, shrimp, copepods*			
Adult	ER-1,ER-2, ER-3,ER-4,ER-5	offshore	shelf edge, hard bottom, banks, reefs*	Summer (N. Gulf), year-round (S. Gulf)		21-179* m	fish			TL=81 cm
Spawning Adult	ER-1,ER-2,ER-5 ER-3, ER-4 (A)	nearshore, offshore (A)	shelf edge, hard bottom, banks, reefs*	spring-fall, April-Nov						

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Banded rudderfish

Banded Rudderfish										
Seriola zonata										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	nearshore, offshore				***10-130***				
Larvae	ER-1, ER-2	nearshore, offshore	WCA	all months except Feb, Apr, Sep, Dec		***10-130***				
post-Larvae	ER-1, ER-2	nearshore, offshore	WCA	all months except Feb, Apr, Sep, Dec		***10-130***				
Early Juvenile	ER-1, ER-2	nearshore, offshore	WCA, drifting algae	year-round		***10-130***				
Late Juvenile	ER-1, ER-2	nearshore, offshore	WCA, drifting algae	year-round		***10-130***				
Adult	ER-1, ER-2	nearshore, offshore	WCA	year-round		10-130	fish, shrimp			
Spawning Adult	ER-1, ER-2	nearshore, offshore	WCA	winter-spring and fall		10-130				

Bold and italicized font indicates proxy data

Banded Rudderfish References

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Blackfin snapper

Blackfin Snapper										
Lutjanus bucanella										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA	year-round		***40-300***				
Larvae	ER-1, ER-2					***40-300***				
post-Larvae	ER-1, ER-2					***40-300***				
Early Juvenile	ER-1, ER-2	nearshore, offshore	hard bottom	spring*		7*-40				
Late Juvenile	ER-1, ER-2	nearshore, offshore	hard bottom	spring*		7*-40				
Adult	ER-1, ER-2	offshore	shelf edge/slope, hard bottom sandy bottom	year-round		40-450	fish, crustaceans		0.23	k=0.084, t_0=-2.896, max age= 20
Spawning Adult	ER-1, ER-2	offshore	shelf edge/slope, hard bottom	year-round peak: spring, fall Feb-Nov		40-450				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Black grouper

Black Grouper										
Mycteroperca bonaci										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA			***18-28***				
Larvae	ER-1, ER-2	offshore	WCA			***10-150***				
post-Larvae	ER-1, ER-2	offshore	WCA			***10-150***				
Early Juvenile	ER-1, ER-2	estuarine, nearshore	SAV	year-round	31	1-10*	crustaceans, fish			
Late Juvenile	ER-1, ER-2	estuarine, nearshore, offshore	reefs, hard bottom, mangrove	year-round		1*-19	crustaceans, fish			
Adult	ER-1, ER-2	nearshore, offshore	reefs, hard bottom (C)		16-28	10-150	fish	sharks, larger groupers	overfishing; $M = 0.136$	rapid first 3-4 yrs; $L_{inf} = 1334$ mm TL, $k = 0.1432$/yr, $t_0 = -0.9028$/yr; max. age = 33 yrs
Spawning Adult	ER-1, ER-2	offshore	reefs, hard bottom, *shelf edge/slope*	Feb-Mar Jan-Apr	*24-27*	18-28			spawning aggregations vulnerable to overfishing	*females range from 57.0-123.5 cm, males from 86.0-132.0 cm; females change sex 85.5-125.0 cm*

**asterisks indicate data collected from outside the Gulf*
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Blueline tilefish

Blueline Tilefish										
Caulolatilus microps										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA			***46-256****				
Larvae	ER-1, ER-2	offshore	WCA			***46-256****				
Post-Larvae	ER-1, ER-2	offshore	WCA			***46-256****				
Early Juvenile	ER-1, ER-2	offshore	WCA			***60-256***				
Late Juvenile	ER-1, ER-2	offshore	WCA			***60-256***				
Adult	ER-1, ER-2	offshore	hard bottom, sand/shell, soft bottom, shelf edge/slope		13.8-18	60-256, burrows at 91-150	benthic inverts, demersal fishes		M = 0.1*	rapid growth in first two years; L_{inf} = 600.3 mm FL, k = 0.33, t_0 = -0.5 yr, max. age = 43 yrs*
Spawning Adult	ER-1, ER-2	offshore	*shelf edge/slope*	*Feb-Oct, peak: Mar-Sep*	8.87-16.28*	46-256*				females mature at 42-45 cm TL, males mature at 50 cm TL

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Cubera snapper

Cubera Snapper										
Lutjanus cyanopterus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs[1]	ER-1	nearshore, offshore	WCA	summer		***10-85***				
Larvae	ER-1	nearshore, offshore				***10-85***				
Post Larvae	ER-1	nearshore, offshore				***10-85***				
Early Juvenile	ER-1	estuarine, nearshore, offshore	SAV, mangrove, emergent marsh		24.5-31.0	***0-85***				
Late Juvenile	ER-1	estuarine, nearshore, offshore	SAV, mangrove, emergent marsh		24.5-31.0	***0-85***				
Adult	ER-1	nearshore, offshore	mangrove, reef	Apr-Sep		0-85			M=0.150	K=0.160, t_0=-.300 , max age= 28
Spawning Adult	ER-1	nearshore, offshore	reef, shelf edge/slope, hard bottom, bank/shoal*	June-Sept, peak: Aug	> 29.0	10-85				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Gag grouper

Gag Grouper										
Mycteroperca microlepis										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA	Dec-Apr		***50-120***				hatch in 45h at 21°C
Larvae	ER-1, ER-2	offshore	WCA	early spring		***50-120***				pelagic larval duration = 29-52 d TL=2.1 cm
Post Larvae	ER-1, ER-2	offshore	WCA			***50-120***				pelagic larval duration = 29-52 d
Early Juvenile	ER-1, ER-2, ER-3	estuarine, nearshore	SAV, mangroves	late spring-early fall	22-32	0-12	crustaceans (amphipods, copepods, grass shrimp)		minimal while in SAV	rapid during association with SAV
Late Juvenile	ER-1, ER-2, ER-3, ER-4	estuarine, nearshore, offshore	SAV, hard bottom, reefs, mangroves, seawhip	recruit to reefs offshore in fall	22-32	1-50	decapod crustaceans and fish	cannibalistic, larger fishes	recreational fishery, shrimp fishery bycatch	ages 1-3
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	hard bottom, reefs	year-round	14-24	13-100	fish, crustaceans, cephalopods	sharks	sudden low temps, fishing mortality; *M* = 0.1342; M= 0.13 +/- 0.03	L_{inf} = 1277.95 mm FL, *k* = 0.1342, t_0 = -0.6687, max. age = 31 yrs TL= 54 cm; Lmax= 145 cm

Spawning Adult	ER-1, ER-2,ER-3, ER-4,ER-5	nearshore,offshore	shelf edge/slope, hard bottom	Dec-May peak: Feb-Mar Jan-Apr; Jan-April, peak Feb-March	21-30	50-120			spawning aggregations vulnerable to fishery	

**asterisks indicate data collected from outside the Gulf*
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Goldface tilefish

Goldface Tilefish										
Caulolatilus chrysops										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs			WCA							
Larvae			WCA							
Post Larvae			WCA							
Early Juvenile										
Late Juvenile										
Adult	ER-2, ER-3	offshore	shelf edge/slope, soft bottom			291 ± 54	*bivalves, urchins, worms, crabs*			
Spawning Adult				Sep*						

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Goliath grouper

Goliath Grouper										
Epinephelus itajara										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-5	offshore	WCA	late summer, early fall		***36-46***				
Larvae	ER-1, ER-5	offshore	WCA	late summer, early fall		***36-46***				pelagic larval duration: 30-80
post-Larvae	ER-1, ER-5	nearshore	mangroves							pelagic larval duration: 30-80
Early Juvenile	ER-1, ER-5	estuarine, nearshore	SAV, mangroves,emergent marsh	Nov-Jan		0-5	crustaceans			growth rate ~ 0.300 mm/d
Late Juvenile	ER-1, ER-5	estuarine, nearshore	SAV, mangroves, emergent marsh, reefs, hard bottom			0-5	crustaceans			growth rate ~ 0.300 mm/d
Adult	ER-1, ER-5	nearshore, offshore	reefs, hard bottom, shoals/banks		20-25	0-95; females at shallower depths until spawning, males at deeper depths	crustaceans (esp. lobster), fish, molluscs (cephalopods)		$Z = 0.85$, $F = 0.70$, $M = 0.15$ Vulnerable to overfishing	$L_{inf} = 2221$ mm TL, $K = 0.0937$, $t_o = -0.6842$, max. age = 37 yrs; Slow growth rate

Spawning Adult	ER-1, ER-5	offshore, nearshore (shelf edge)	reefs, hard bottom,	Jun-Dec peak: Jul-Sep Jun-Oct strongly influenced by lunar pattens	25-26	36-46				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Gray snapper

Gray Snapper										
Lutjanus griseus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA	Jun-Sep		***0-180***				pre-settlement duration: 25-33
Larvae	ER-1, ER-2	offshore	WCA	Apr-Nov peak: Jun-Aug	15.6-27.2	***0-180***	Zooplankton (lab)	carnivorous fish		pre-settlement duration: 25-33
Post Larvae	ER-1, ER-2	estuarine	SAV				copepods, amphipods	carnivorous fish		pre-settlement duration: 25-33
Early Juvenile	ER-1, ER-2	estuarine	SAV, mangrove, emergent marsh		12.8-36.0	1-3	amphipods	carnivorous fish		growth rate = 0.60-1.02 mm/d; *SAV residents ~ 8 months; settle Sep-Oct (at 7.8 cm TL)*
Late Juvenile	ER-1, ER-2	estuarine, nearshore	SAV, mangrove, emergent marsh		12.8-36.0	***0-180***	penaeid shrimp, crabs, fish, mollusks, polychaetes	carnivorous fish		growth rate = 0.60-1.02 mm/d; *SAV residents ~ 8 months; occupy mangroves from 10-12+ cm TL*
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	hard bottom, soft bottom, reefs, sand/shell, banks/shoals, emergent marsh		13.4-32.5	0-180	fish, shrimp, crabs		Z=0.17-0.22, M=0.15	recruit to fishery age 4; max. age = 28 yrs; L_{inf} = 656.4 mm TL, k = 0.22, t_0 = 0

Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	reefs, banks/shoals	year-round (S. FL), summer elsewhere		0-180				maturation at 185 mm TL for males and 200 mm TL for females

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Gray triggerfish

Gray Triggerfish										
Balistes capriscus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	reefs	late spring, summer		***10-100***		wrasses, red snapper		hatch in 48-55 hrs
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5		WCA, drifting algae							spend 4-7 months in pelagic zone
post-Larvae	ER-1, ER-2, ER-3, ER-4, ER-5		WCA, drifting algae					tuna		spend 4-7 months in pelagic zone
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5		drifting algae,				algae, hydroids, barnacles, polychaetes	tuna, blue marlin, dolphinfish, sailfish, sharks		spend 4-7 months in pelagic zone
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	drifting algae, reefs			***10-100***	algae, hydroids, barnacles, polychaetes		*Z = 0.95, M = 0.28*	*L_{inf} = 457, K = 0.33, t_0 = -1.58*
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	reefs			10-100	bivalves, barnacles, polychaetes, decapod crabs, gastropods, sea stars, sea cucumbers, brittle stars, sea urchins, sand dollars	greater amberjack, sharks, groupers	predation, recreational fishery (age 3), commercial fishery (age 4). *Z = 0.95, M=0.28*	rapid in year one, then slows. Relatively long lived. *L_{inf} = 457, K = 0.33, t_0 = -1.58*

Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	reefs	late spring, summer; May-Aug Peak June-July	20.9-30.0	10-100	bivalves, barnacles, polychaetes, decapod crabs, gastropods, sea stars, sea cucumbers, brittle stars, sea urchins, sand dollars	greater amberjack, sharks, groupers.	predation, recreational fishery (age 3), commercial fishery (age 4)	rapid in year one, then slows. Relatively long lived. Males larger than females

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Greater ambjerack

Greater Amberjack										
Seriola dumerili										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5		WCA							hatch in 2 days
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	year-round						
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA, drifting algae	summer						
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA, drifting algae	summer-fall			invertebrates		Z=0.0045	1.65-2.00 mm/d
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA, drifting algae, hard bottom	summer-fall			invertebrates		Z=0.0045	1.65-2.00 mm/d
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA, hard bottom, banks/shoals, reefs*	year-round	14.25	4.6-187	fish, crustaceans, cephalopods		males (7-8 yrs) have shorter life span than females (10-15 yrs)	females usually larger than males; L_{inf} = 1436 mm FL, k = 0.175, t_0 = -0.954, max. age = 15 yrs
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA, reef*	Feb-May						50% maturity at *644 mm FL (males)*; 900 mm FL & age 4 (females)

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Hogfish

Hogfish										
Lachnolaimus maximus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2		WCA	Apr-Dec	25.5			yellowtail snapper		hatch in ~ 23hrs
Larvae	ER-1, ER-2		WCA							23 hrs-13 d
Post Larvae	ER-1, ER-2		WCA							13 d-34 d
Early Juvenile	ER-1, ER-2	estuarine, nearshore reef	SAV, reef	Dec-Apr						
Late Juvenile	ER-1, ER-2	estuarine, nearshore reef	SAV, reef	Dec-Apr						
Adult	ER-1, ER-2	nearshore, offshore	hard bottom, reefs	year-round	15.7-31.2	< 30: shallow reef Adult larger than deep reef Adult	benthic inverts		*M*/yr = 0.16-1.47 depending on estimation method	max. age = 25; L_{inf} = 84.90 cm FL, ER 1 L inf= 414mm TL, k = 0.106, t_o = -1.33
Spawning Adult	ER-1, ER-2	nearshore, offshore	reef, sand, hard bottom	Dec-Jul peak: Mar-Apr Nov-Jun (A)		1-69:	sand-dwelling mollusks, sea urchins			50% maturity = 169.0 mm FL and 1.1 yrs (female), 426 mm FL and 6.5 yrs (males)

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Lane snapper

Lane Snapper										
Lutjanus synagris										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Mar-Sep, peak: Jul-Aug		***4-132***				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore*	WCA*	Jun-Aug*	28(lab); 28.4-30.4*	0-50*	plankton and rotifers (lab)		death by day 10 at 25°C in lab; * Z = -0.429± 0.053(SE), subject to size-selective mortality*	*SL-age curve = 0.032, K = 0.047 ± 0.008 (SE; W. Straits of FL), K = 0.042 ± 0.008 (SE; E. Straits of FL), PLD = 25.6 d* L=1.9-6.2
Post Larvae	ER-1, ER-2, ER-3, ER-4,ER-5	*estuarine, nearshore, offshore*	WCA*, SAV	Jun-Aug*	28.4-30.4*	0-50*			death by day 10 at 25°C in lab; * Z = -0.429± 0.053(SE), subject to size-selective mortality*	*SL-age curve = 0.032, K = 0.047 ± 0.008 (SE; W. Straits of FL), K = 0.042 ± 0.008 (SE; E. Straits of FL), PLD = 25.6 d*
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	SAV, sand/shell, reefs, soft bottom, banks/shoals, *mangrove*	late summer-early fall	28-29.5	0-24	copepods, grass shrimp, small inverts		subject to growth-selective mortality*, daily Z = 0.097-0.165	settle Jul-Aug, min. settle length = 15.1 mm SL, min. settle age = 25 d, growth rate = 0.9-1.3 mm/d

Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	SAV, reefs, sand/shell, soft bottom, banks/shoals, *mangrove*	late summer-early fall	28-29.5	0-24	copepods, grass shrimp, small inverts		subject to growth-selective mortality*, daily Z = 0.097-0.165	growth rate = 0.9-1.3 mm/d
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore,est	sand/shell, banks/shoals (B)		16-29	4-132	fish, crustaceans, annelids, mollusks, algae		Z = 0.38-0.58; M = 0.11-0.24	max. length = 673 mm TL. Males grow faster, and larger at age than females; L_{inf} = 449 mm FL, k = 0.17, t_0 = -2.59, max. age = 19 yrs K= 0.13, t_0=-4.26
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	*reef, shelf edge/slope*	May-Aug Mar-Sep Peak: May and July		30-70m*				50% maturity = 27.4 cm (females), 28.2 cm (males); 100% maturity > 40.0 cm TL (females), > 38.8 cm TL (males)*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Lesser amberjack

Lesser Amberjack										
Seriola fasciata										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5									
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5									
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5									
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	drifting algae	late summer-fall		***55-348***				
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	drifting algae, hard bottom, reef	late summer-fall		*55-348*				
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	hard bottom, reef	year-round		*55-348*	squid			females slightly larger than males (408.8 vs 396.2 mm FL)
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	hard bottom	Sep-Dec, Feb-Mar		***55-348***				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Mutton snapper

Mutton Snapper										
Lutjanus analis										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1		WCA	Late spring-summer						
Larvae	ER-1		WCA	early summer						PLD = 31 d
Post Larvae	ER-1		WCA	early-mid summer						PLD = 31 d
Early Juvenile	ER-1		SAV	summer						
Late Juvenile	ER-1		SAV, reefs	late summer						
Adult	ER-1	near,est	SAV, reefs	year-round			crustaceans, fish, gastropods		M = 0.17	L_{inf} = 861 mm TL, K = 0.165, t_0 = -1.23, max. age = 40 TL=50cm
Spawning Adult	ER-1(A)	offshore	reefs, bank/shoals, hard bottom, shelf edge/slope	Mar-Jul May-Aug		25-95			heavy fishing pressure at spawning aggregations	

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Queen snapper

Queen Snapper										
Etelis oculatus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1	offshore	WCA			***95-680***				
Larvae	ER-1	offshore	WCA	*Sep-Nov*		*0-100*			Z = -0.113 ± 0.023 (SE)*	SL-age curve = 0.113, K = 0.040 ± 0.003 (SE), PLD ≤ 36 d*
Post Larvae[7]	ER-1	offshore	*WCA*	*Sep-Nov*		*0-100*			Z = -0.113 ± 0.023 (SE)*	SL-age curve = 0.113, K = 0.040 ± 0.003 (SE), PLD ≤ 36 d*
Early Juvenile	ER-1	offshore	WCA			***95-680***	crustaceans*	Beardfish*		
Late Juvenile	ER-1	offshore				***95-680***	crustaceans*			
Adult	ER-1	offshore	hard bottom, *shelf edge/slope*		16-18	95-680	squid, shrimp, deep water-fishes *		Z/K = 3.73*	Up to 100 cm TL; at least 30 yrs; L_{inf} = 90.57 cm FL, females larger than males*
Spawning Adult	ER-1	offshore		*year-round peak: Oct-Nov*		95-680				50% maturity = 310 mm FL (females), 220 mm FL (males); 100% maturity = 370 mm FL*

**asterisks indicate data collected from outside the Gulf*
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Red grouper

Red Grouper										
Epinephelus morio										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA	Apr-May		20-100			*M* = 194.93*	hatch in 30 hrs at 24°C
Larvae	ER-1, ER-2	offshore	WCA	May-Jun	optimum: 27.4-28.5	20-100	zooplankton		*M*= 13.03-153.10 (depending on age)*	stage lasts 30-40 days post-hatch
Post Larvae	ER-1, ER-2		WCA	May-Jul					*M* = 13.03-153.10 (depending on age)*	stage lasts 35-50 days post-hatch, leave plankton at about 20 mm SL
Early Juvenile	ER-1, ER-2	nearshore	SAV, hard bottom		16.1-31.2	0-15	demersal crustaceans	larger fishes	*M* = 2.52-5.73 (depending on age)*; low DO (3.9-4.7 mg/L) has caused mortality	
Late Juvenile	ER-1, ER-2	nearshore, offshore	hard bottom			0-50	demersal crustaceans, fishes	larger demersal fishes	*M* = 2.52-5.73 (depending on age)*	influenced by food availability, population density
Adult	ER-1, ER-2, ER-3, ER-4	nearshore, offshore	hard bottom, reefs		15-30	3-190	fish, crustaceans, cephalopods	larger demersal fishes, sharks	*Z* = 0.39; *M* (> age 2) = 0.1194-0.2583 Max age= 25 yrs	max. age 29; L_{inf} = 829 ± 5.50 mm FL, *k* = 0.1251 ± 2.0 x 10^{-3}, t_0 = -1.2022 ± 3.4x10^{-2}

Spawning Adult	ER-1, ER-2	offshore	shelf edge/slope, hard bottom	Feb-June peak: Apr-May	*16.97-24.08* 16-29	20-100 1-200				population density and environmental stress may influence sexual transition; 50% maturity = 2.8 yrs, 292 mm FL; 50% transition = 11.2 yrs, 707 mm FL

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Red snapper

Red Snapper										
Lutjanus campechanus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Apr-Oct		**18-126**				50% hatch in 20-27 hrs 16.4 mil ova/year
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Jul-Nov	17.3-29.7	**18-126**	algae, rotifers*			PLD = 28 d
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Jul-Nov	17.3-29.7	**18-126**				settle at 16-19 mm TL; PLD = 28d
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	low relief reefs, hard bottom, banks/shoals, soft bottom, sand/shell, shelf,,muddy bottom	Jul-Nov	17.3-29.7	17-183	zooplankton, shrimp, chaetognaths, squid, copepods		shrimp trawl bycatch; *M* (age 0) = 2.0/yr	0.817-1.01 mm/d
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	low relief reefs, hard bottom, banks/shoals, soft bottom, sand/shell shelf/muddy bottom habitats	year-round	20-28	18-55	fish, squid, crabs, shrimp (B)		shrimp trawl bycatch; *M* (age 1) = 1.2/yr	0.817-1.01 mm/d

Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	reefs, hard bottom, banks/shoals. Unstructured bottom habitats	year-round	14-30	7-146	fish, shrimp, squid, octopus, crabs	sharks	enter fishery at age 2; M = 0.094/yr	L_{inf} = 85.64 cm TL, K = 0.19, t_0 = -0.39, max. age = 57 yrs; TL=742 mm
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	sand/shell, banks/shoals	Apr-Oct year-round May-Sep Peak: May-Aug	15-31	18-126 Max: 200				50% mature (female) at age 3-5, 400-450 mm TL; 100% mature (female) at age 8, 700 mm TL

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Scamp

Scamp										
Mycteroperca phenax										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA	spring		***60-189***				
Larvae	ER-1, ER-2	offshore	WCA	spring		***60-189***				L=7.6mm
Post Larvae	ER-1, ER-2	offshore	WCA	spring		***60-189***				
Early Juvenile	ER-1, ER-2	nearshore, offshore	hard bottom, reef			12-33				
Late Juvenile	ER-1, ER-2	nearshore, offshore	hard bottom, reef			12-33				
Adult	ER-1, ER-2	nearshore, offshore	hard bottom, reef		14-28	12-189 max: 275	fish, crustaceans, cephalopods	sharks	catch and release mortality > 44m M= 0.143 Max age= 48, TL= 33 cm	reach maximum size slowly K=0.126, t_0=-1.357
Spawning Adult	ER-1, ER-2, ER-3, ER-4	offshore	shelf edge/slope, reef, hard bottom	Jan-Jun	> 8.6	60-189			fishing pressure may reduce proportion of males in population	

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Silk snapper

Silk Snapper										
Lutjanus vivanus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1	offshore		year-round		**90-200**				
Larvae	ER-1	offshore		year-round		**90-200**				
Post Larvae	ER-1	offshore		year-round		**90-200**				
Early Juvenile	ER-1	offshore		year-round		30-40*				
Late Juvenile	ER-1	offshore				30-40*	fishes, shrimp, crabs	sharks, grouper, barracuda		
Adult	ER-1	offshore	shelf edge/slope, soft bottom, hard bottom*		13-27*	90-200	fish, shrimp, crabs, gastropods, cephalopods, tunicates, urochordates	sharks, grouper, barracuda	M = 0.230	L_{inf} = 781.1 mm TL, K = 0.092, t_0 = -2.309, max. age = 9 yrs
Spawning Adult	ER-1	offshore		Mar-Nov; peak: Jul-Aug		**90-200**	fishes, shrimp, crabs	sharks, grouper, barracuda		50% maturity = 50-55 cm FL (females), 38-60 cm FL (males)*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Snowy grouper

Snowy Grouper										
Epinephelus niveatus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1	offshore	WCA			***30-525***				
Larvae	ER-1	offshore	WCA	Jun, Oct	28	***30-525***				SL= 5.5-10.2 mm
Post Larvae	ER-1	offshore	WCA	Jun, Oct	28	***30-525***				
Early Juvenile	ER-1	nearshore	reefs			> 1				
Late Juvenile	ER-1	nearshore, offshore	reefs		15-29*	17-60	fish, gastropods, cephalopods, other inverts		trawl bycatch	
Adult	ER-1, ER-2	offshore	hard bottom, reef, *shelf edge/slope *		12-26	30-525	fish, crabs, crustaceans, cephalopods, gastropods		vulnerable to fishing pressure; *M* = 0.12*	recruit to fishery at age 8; L_{inf} = 1064.62 mm TL, *K* = 0.094, t_0 = -2.884, max. age = 35 yrs
Spawning Adult	ER-1, ER-2	offshore	reef, shelf edge/slope *	Apr-Jul (FL Keys), May-Aug (w. FL) Jan-Oct		30-525			overfishing causes sex ratio imbalance	protogynous hermaphrodites; L_{50} = 541 mm TL and 4.92 yrs; 40% of fish ≥ 8 yrs (70 cm) are male; transition = 6-7 yrs and 475 mm FL

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

Snowy Grouper References

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Speckled hind

Speckled Hind										
Epinephelus drummondhayi										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	offshore	WCA			***44*-183***				
Larvae	ER-1, ER-2	offshore	WCA			***44*-183***				
Post Larvae	ER-1, ER-2	offshore	WCA			***44*-183***				
Early Juvenile	ER-1, ER-2	offshore	reef*			***25-183***				
Late Juvenile	ER-1, ER-2	offshore	reef*			***25-183***				
Adult	ER-1, ER-2	offshore	hard bottom		17-24	25-183	fish, cephalopods, other inverts		overfishing; **M*=0.13, *F*=1.14, *Z*=1.27*	recruit to fishery at 6-7 yrs; * max. length = 973 mm TL*; L_{inf} = 888 mm TL, *K* = 0.12, t_0 = -1.8, t_0= -0.01 max. age = 45 yrs
Spawning Adult	ER-1, ER-2	offshore	shelf edge/slope	Apr-May, Jul-Sep April-Sep		44*-183			fishing affects sex ratio and spawning biomass; males rare	protogynous hermaphrodites; L_{50} = 532 mm TL and 6.6 yrs (females); 50% transition = 627 mm TL and 6.9 yrs*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Tilefish

Tilefish										
Lopholatilus chamaeleonticeps										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	late spring-summer	hatched in 40 hrs at 22.0-24.6 (lab)	***80-450***				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	summer		***80-450***				
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	summer		***80-450***				
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***80-450***				settlement at 9.0-15.5 mm SL
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, soft bottom			***80-450***		larger tilefish, other fish		
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, soft bottom		9-14.4	80-450	bivalve mollusks, squids, polychaetes, holothurians, decapod, crustaceans, elasmobranchs, and ray-finned fishes	sharks, other tilefish	mass mortality from cold water intrusion events; M = 0.137	max. length = 1000 mm SL; males grow faster, reach larger size; L_{inf} = 830 mm TL, k = 0.13, t_0 = -2.14, max. age = 40 years

Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, soft bottom	Jan-Jun peak: Apr		80-450				maturity < 1 yr and 150 mm FL (male); 2.5 yrs and 331 mm FL (female); protogynous hermaphrodites

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Vermillion snapper

Vermilion Snapper										
Rhomboplites aurorubens										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***18-100***				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Jun-Nov*		30-40*				
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Jun-Nov*		30-40*				
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	hard bottom, reefs			***18-100***	copepods, nematodes*	lionfish		
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	hard bottom, reefs			***18-100***	fish scales, copepods, small pelagic crustacean, cephalopods*	lionfish		
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	bank/shoal, reef, hard bottom	year-round*	16.4-26.2*	18-100	benthic tunicates, amphipods,juvenile vermilion (rare), cephalopods*		$Z = 0.39 \pm 0.05$ $M = .25$	L_{inf} = 34.4 cm FL, k = 0.3254, t_0 = -0.7953, max. age = 26 yrs TL=208-565 mm
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore		May-Sep Apr-Sep		***18-100***				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

Vermillion Snapper References

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Warsaw grouper

Warsaw Grouper										
Epinephelus nigritus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***40-525***				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***40-525***				SL=9.1 mm
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***40-525***				
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore				***20-30***				
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	reefs			20-30 >200m				
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	Shelf edge/slope, hard bottom		12-25	40-525	crabs, shrimp, lobsters, fish		M=0.069 ; M differed in different regions; western Gulf =0.17, eastern Gulf=0.08; Z=0.09-0.18	*L_{inf} = 2394 mm Linf=1,850 mm; TL, K = 0.034, t_0 = -3.616; max. age =91 yrs, max. length = 188.8cm TL* Max age: 91
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope,hard bottom, reef	late summer Apr-Nov		40-525				protogynous hermaphrodite; mature at 9 yrs

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Warsaw Grouper References

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Wenchman

Wenchman										
Pristopomoides aquilonaris										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-3, ER-4, ER-5	offshore	WCA	summer	20	***80-200***				
Larvae	ER-3, ER-4, ER-5	offshore	WCA	summer		***80-200***				
Post Larvae	ER-3, ER-4, ER-5	offshore		summer		***80-200***				
Early Juvenile	ER-3, ER-4, ER-5	offshore				***19-481***				
Late Juvenile	ER-3, ER-4, ER-5	offshore				***19-481***				
Adult	ER-3, ER-4, ER-5	offshore	hard bottom, shelf edge/slope	year-round	9.1-28.7	19-481	small fish		M=0.44	L_{inf} = 240 mm FL, K = 0.18, t_0 = -4.75, max. age (# otolith increments) = 14
Spawning Adult	ER-3, ER-4, ER-5	offshore	shelf edge/slope	summer	20	80-200				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Yellowedge grouper

Yellowedge Grouper										
Hyporthodus flavolimbatus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***35-370***				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA			***35-370***				
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	Jul-Oct*		***35-370***				
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore				9-110				
Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	hard bottom			9-110				
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	hard bottom, soft bottom, *shelf edge/slope*		10.7-27.0	35-370	brachyuran crabs, fish, other inverts		Z = 0.128, M =0.073, F = 0.038-0.080	max. age = 85 yrs,; L_{inf} = 1005 mm TL, K = 0.059, t_0 = -4.75 max length= 54.88 cm TL
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, reefs*	May-Sep; Feb-Nov	14.47* 11-21	35-370 75-350 (D)				Protogynous hermaphrodites; L50 = 547 mm TL and 8 yrs (females), 50% transition = 815 mm TL and 22 yrs

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Yellowfin grouper

Yellowfin Grouper										
Mycteroperca venenosa										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1	offshore				***25-30****				
Larvae	ER-1	offshore				***25-30****				
Post Larvae	ER-1	offshore				***25-30****				
Early Juvenile	ER-1	estuarine, nearshore	SAV			2-4				
Late Juvenile	ER-1		SAV, hard bottom				fish, squid, shrimp*			
Adult	ER-1	nearshore, offshore	reefs, hard bottom		15-26	2-214	fish, squid, shrimp*	sharks	M=0.18	max. length = 90 cm TL, *max. age = 13 yrs, L_{inf} = 977 mm TL, K = 0.14, t_0 = -1.50* Max age= 67
Spawning Adult	ER-1	offshore	shelf edge/slope, reef, hard bottom, banks/shoals*	Jan-Aug		*25-30*			fishing may affect sex ratios	protogynous; smallest males found at 54 cm TL; *50% maturity = 561 mm TL and 4.66 yrs (female); 50% transition = 716-871 mm TL and 8-9 yrs*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Yellowmouth grouper

Yellowmouth Grouper										
Mycteroperca interstitialis										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-5	offshore	WCA			***20-189***				
Larvae	ER-1, ER-5	offshore	WCA			***20-189***				
Post Larvae	ER-1, ER-5	offshore	WCA			***20-189***				
Early Juveniles	ER-1, ER-5		mangrove							
Late Juvenile	ER-1, ER-5		mangrove				fish*			
Adult	ER-1, ER-2, ER-4, ER-5	offshore	hard bottom, reef, banks/shoals		19-24	20-189	fish, crustaceans, other inverts	sharks, large fish	Z = 0.25-0.28; *M = 0.14*	long-lived, slow growing, fastest growth in first two year; maximum age/length = 28 yrs/83 cm TL; L_{inf} = 828 mm TL, K = 0.076, t_0 = -7.5 Max age= 36 (A); L50= 3.41 yrs/ 363.7mm TL
Spawning Adult	ER-1, ER-2, ER-5	offshore		year-round peak: Apr-May (in FL)		20-189				protogynous; females mature at 400-450 mm TL (age 2-4); transition to males at 505-643 mm TL (age 5-14)

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Yellowtail snapper

Yellowtail Snapper										
Ocyurus chrysurus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2	nearshore, offshore	WCA	Feb-Oct		***1-183***				
Larvae	ER-1, ER-2	nearshore, offshore	WCA			***1-183***				*K = 0.048 ± 0.007 (west Straits of FL), K = 0.041 ± 0.007 (east Straits of FL)*; avg. PLD = 25.3 d
Post Larvae	ER-1, ER-2	nearshore, offshore	WCA			***1-183***				*K = 0.048 ± 0.007 (west Straits of FL), K = 0.041 ± 0.007 (east Straits of FL)*; avg. PLD = 25.3 d
Early Juvenile	ER-1, ER-2	estuarine, nearshore	SAV, mangrove	fall	24-30	0.3-1.2 *	zooplankton			
Late Juvenile	ER-1, ER-2	estuarine, nearshore, offshore	reefs, *hard bottom*		24-30	***1-183***	zooplankton			
Adult	ER-1, ER-2	nearshore, offshore	reefs, hard bottom		18-34	1-183	benthic and pelagic reef fish, crustaceans, mollusks		M = 0.194; natural mortlaity 0.385-0.147	max. age = 28 years; L_{inf} = 618.0 mm TL, K = 0.133, t_0 = -3.132;
Spawning Adult	ER-1, ER-2	nearshore, offshore		Apr-Aug		***1-183***				L50 = 232 mm TL and 1.7 yrs

										(female), 19.4 cm FL (male)*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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A.2 Coastal Migratory Pelagic FMP Species EFH

Cobia

Cobia										
Rachycentron canadum										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore	WCA	summer	28.1-29.7	top meter of water column				hatch within 36 hrs
Larvae	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	WCA	May-Sep	24.2-32	3.1-300, in surface waters	zooplankton, primarily copepods (lab)			22 mm SL in 22 days (lab)
post-Larvae	ER-3, ER-4, ER-5	nearshore, offshore	WCA	May-Jul	25.9-30.3	11-53 * in or near surface waters*	zooplankton, primarily copepods (lab)			25 mm SL in 25 days (lab)
Early Juvenile	ER-3, ER-4, ER-5	nearshore, offshore	WCA	Apr-Jul	16.8-25.2*	5-300 * in or near surface waters*	*Gambusia*, shrimp and fish parts (lab)			~ 55 mm SL by 50 days (lab)
Late Juvenile	ER-3, ER-4, ER-5	nearshore, offshore	WCA	May-Oct		***1-70***	fish, shrimp, squid	Mahi-mahi		231 mm SL by 130 days (lab)
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA, banks/shoals	Mar-Oct (n. Gulf), Nov-Mar (s. Gulf, s. FL)	23.0-28.0	1-70	crustaceans and fish		M = 0.38/yr	rapid growth for first two yrs; L_{inf} = 1281.5 mm FL, k = 0.42, t_0 = -0.53, max. age = 11 yrs
Spawning Adult	ER-3, ER-4, ER-5	nearshore, offshore	WCA	Apr-Sep (n. Gulf)	23.0-28.0	***1-70***				50% maturity at age 2

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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King mackerel

King Mackerel										
Scomberomorus cavalla										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER- 5	offshore	WCA	spring, summer	hatch = 18-21 hrs at 27	35-180				1.3 to 38 mm BL
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	May-Oct	20-31	***35-180***	larval fish (carangids, clupeids, engraulids)	young pelagics (tuna, dolphin)	predation, starvation	enhanced in n.c. Gulf and n.w. Gulf, associated with MS River plume
post-Larvae	ER-1, ER-2, ER-3, ER-4, ER-5									
Early Juvenile	ER-3, ER-4, ER-5	nearshore, offshore	WCA	May-Oct peak: Jul, Oct		≤ 9	fish, some squid	larger pelagic fish	bycatch (shrimp fishery), sport fishery	enhanced in n.c. Gulf and n.w. Gulf, associated with MS River plume
Late Juvenile	ER-3, ER-4, ER-5	nearshore, offshore	WCA				estuarine-dependent fish, some squid	larger pelagic fish	bycatch (shrimp fishery), commercial and recreational fisheries	enhanced in n.c. Gulf and n.w. Gulf, associated with MS River plume

Adult	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA		> 20	0-200	fish, squid, shrimp; feeding sometimes associated with *Sargassum*	larger fish, sharks, dolphin, tuna	fishing mortality, $M = 0.174$	highest growth occurs in eastern Gulf; L_{inf} = 128.1 cm FL, k = 0.12, t_0 = -2.60; max. age = 24 yrs; western gulf Linf= 147.2, k=0.021*
Spawning Adult	ER-3, ER-4, ER-5	offshore	WCA	May-Oct Peak: Jun-Sep	> 20	35-180				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Spanish mackerel

Spanish Mackerel										
Scomberomorus maculatus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-2, ER-3	nearshore, offshore	WCA	spring, summer	hatch in 25 hours at 26	< 50				
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA	May-Oct	20-32	9-84	larval fish, some crustaceans	dolphin, tuna		
post-Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	WCA	May-Oct	20-33	9-84	larval fish, some crustaceans	dolphin, tuna		
Early Juvenile	ER-2, ER-3	estuarine, nearshore	WCA, sandy bottom (B)	Mar-Nov	15.5-34.0	1.8-9.0	mostly fish, some crustaceans, gastropods, shrimp	pelagic fishes	bycatch in shrimp trawl fishery	
Late Juvenile	ER-2, ER-3	estuarine, nearshore, offshore	WCA, sandy bottom (B)	Mar-Nov	15.5-34.0	1.8-50	fish, squid	pelagic fishes	bycatch in shrimp trawl fishery,	
Adult	ER-1, ER-2, ER-3	estuarine, nearshore, offshore	WCA	n. Gulf in spring, s. Florida and Mexico in fall	15.5-34.0	3-75	fish, crustaceans, squid	larger pelagics	fishing mortality, impacted by baitfish harvest; M = 0.38/yr	females grow faster, live longer than males; t_0 = -0.5, k = 0.61, L_{50}= 31.41 cm FL; L_{inf} = 560 mm FL; max. age = 11 yrs
Spawning Adult	ER-2, ER-3	nearshore, offshore	WCA	May-Sep Apr-Oct	> 25	< 50 (B)				

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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A.3 Shrimp FMP EFH

Brown shrimp

Brown Shrimp										
Penaeus aztecus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
fertilized eggs (0.26 mm diameter)	ER-3, ER-4, ER-5	offshore	soft bottom, sand/shell	fall and spring	>24	***18-110***				hatch 24 hrs after spawning
Larvae, pre-settlement Post Larvae (< 14 mm	ER-3, ER-4, ER-5	estuarine, nearshore, offshore	WCA	year-round, peak: spring	28-30	0-82	phytoplankton and zooplankton	fish, some zooplankton		
late Post Larvae, juveniles (14-80 mm)	ER-3, ER-4, ER-5	estuarine	SAV, emergent marsh, intertidal creek estuaries, oyster reef, soft bottom, sand/shell	spring-fall Feb-Apr	7-35	< 1	benthic algae, polychaete worms, peracarid crustaceans	fish (southern flounder, spotted seatrout, red drum, Atlantic croaker, pinfish, sea catfish)	predation is major cause of mortality, cold temperatures in shallow water	Higher growth rates in salt marsh than soft bottom and with carnivorous feeding; reduced growth in low salinity due to increased metabolic costs and decreased food resources; 0.9 mm/day
sub-Adult	ER-3, ER-4, ER-5	estuarine, nearshore	soft bottom, sand/shell	spring-fall	18-28	1-18	Polychaetes, amphipods, other benthic inverts	fish (southern flounder, spotted seatrout, red drum, Atlantic croaker,	cold fronts, hypoxia	

								pinfish, sea catfish)		
non-Spawning Adult (females > 140 mm TL	ER-3, ER-4, ER-5 ER-1, ER-2	offshore	soft bottom, mud substrate,sand/shell mangroves (A)	summer and fall Highest Density in October	10-37	14-110	omnivorous, feed at night	larger fish		
Spawning Adult	ER-3, ER-4, ER-5	offshore	soft bottom, mud substrate, sand/shell mangroves (A)	fall and spring, year-round in depths > 64 m Sep-May, Spawn at night (B)		18-110	omnivorous, feed at night	larger fish		

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Pink shrimp

Pink Shrimp										
Penaeus duorarum										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
fertilized eggs (0.31-0.33 mm diameter)	ER-1, ER-2, ER-3, ER-5	offshore	sand/shell	year-round	> 27	***9-48***				
Larvae, pre-settlement Post Larvae (< 15 mm)	ER-1, ER-2, ER-3, ER-5	estuarine, nearshore, offshore	WCA	year-round	15-35	1-50	phytoplankton, zooplankton	fish, inverts	mortality is higher at 35°C	
late Post Larvae, juveniles (> 15 mm)	ER-1, ER-2, ER-3, ER-5	estuarine, nearshore	SAV, soft bottom, sand/shell, mangroves (low densities)	year-round (W. FL); Fall-Spring (TX)	6-38	0-3	seagrass, annelids, small crustaceans, shrimp, bivalves	fish (spotted seatrout, red drum, toadfish, others)	no recorded kills from cold fronts	0.05-2.08 mm CL/week*
sub-Adult	ER-1, ER-2, ER-3, ER-	estuarine, nearshore, offshore	SAV, soft bottom, sand/shell, mangroves (low densities), *oyster reefs*	year-round (W. FL); Fall-Spring (TX)	6-38	1-65	annelids, small crustaceans, shrimp, bivalves	fish (spotted seatrout, sand seatrout, gray snapper, mackerels, red drum, grouper)	avoid cold by migrating to deeper water; low predation offshore	0.05-2.08 mm CL/week*
non-Spawning Adult (> 75 mm TL	ER-1, ER-2, ER-3, ER-5 Eastern Gulf	nearshore, offshore	sand/shell Mangroves, soft substrates , Calcareous Muds, seagrass and shoal grass	year-round highest density: Aug-Dec	16-31	1-110 1-64	carnivores	larger fish, sharks	low predation offshore	Female TL= 280 mm, Male TL= 269 mm

Spawning Adult (capable at 65-75 mm TL)	ER-1, ER-2, ER-3, ER-5 Eastern Gulf	nearshore, offshore	sand/shell Mangroves, soft substrates, Calcareous Muds, seagrass and shoal grass	year-round (W. FL), spring-fall (TX) Apr- Sep	16-31	9-48 4-48	carnivores	larger fish, sharks	low predation offshore	

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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Royal red shrimp

Royal Red Shrimp										
Pleoticus robustus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-3	offshore	shelf edge/slope	year-round	9-12	250-550				
Larvae	ER-1, ER-3					***250-550***				
Post Larvae	ER-1, ER-3					***250-550***				
Early Juvenile	ER-1, ER-3					***250-550***				
Late Juvenile	ER-1, ER-3					***250-550***				
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, soft bottom, sand/shell	year-round	5-15	140-750	small benthic organisms			*max. length = 184 mm (male), 229 mm (female); can live up to 5 years*
Spawning Adult	ER-1, ER-2 ER-3, ER-4, ER-5	offshore	shelf edge/slope	year-round		250-550				*maturity = 125 mm TL (male), 155 mm TL (female)*

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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White shrimp

White Shrimp										
Penaeus setiferus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
fertilized Eggs	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore		spring-fall		9-34			daily *Z* = 0.373	demersal eggs, hatch 10-12 hrs after spawning; egg/larval stage lasts 16 days
Larvae/ pre-settlement Post Larvae[1],	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore		spring-fall	17.0-28.5	0-82	phytoplankton and zooplankton	fish, some zooplankton		egg/larval stage lasts 16 days
late Post Larvae/ juveniles	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore	emergent marsh, SAV, oyster reefs, soft bottom, mangrove	late spring-fall Jun-Sep;May-Aug	Post Larvae 13-31; juveniles 9-33	< 1 5m (B)	omnivorous; detritus, annelid worms, pericarid crustaceans, caridean shrimp, diatoms	fish	predation; daily *Z* = 0.014-0.126	growth rates increase with temps 18-32.5°C, but decrease at 35°C; grow slowly at < 18°C; 0.3-1.2 mm/ day; stage duration = 79 days
sub-Adult	ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	soft bottom, sand/shell	summer-fall	*> 6 *	1-30	omnivorous, scavengers;annelids, insects, detritus,gastropods, copepods,bryozoans, sponges, corals, fish, filamentous algae,	fish	daily *Z* = 0.023-0.048	stage duration = 33 days; 0.4-1.5 mm/day

							vascular plant stems and roots			
Adult	ER-1. ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	soft bottom	late summer and fall	7-38	< 27	omnivorous	larger fish	daily Z = 0.004-0.034	adult/spawning adult stage duration is about 237 days; 0.4-1.0 mm/day
Spawning Adult	ER-2, ER-3, ER-4, ER-5	offshore	Soft bottom	spring-late fall peak: Jun-Jul		9-34	omnivorous	larger fish		adult/spawning adult stage duration is about 237 days; 0.4-1.0 mm/day

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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A.4 Red Drum FMP EFH

Red Drum

Red Drum										
Sciaenops ocellatus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
Eggs	ER-1, ER-2, ER-3, ER-4, ER-5		WCA	summer,fall	20-30	**20-30**			high early in spawning	
Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine	SAV, soft bottom, WCA	late summer, fall	18.3-31		copepods	larger piscivorous fish	Higher at 20-24°C than 25-30°C	0.5 mm/day. Faster at 25-30°C. 3-6 mm at 2 weeks. peak settlement from 6-8 mm TL
Post Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine	SAV, emergent marsh, soft bottom, sand/shell	late summer, fall	18.3-31.0		copepods	larger piscivorous fish		Increased with increasing salinity (up to 30 ppt)
Early Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore	SAV, soft bottom, emergent marsh	Sep-Dec	> 5-32.2	0-3	copepods, mysids, amphipods, shrimp, polychaetes, insects, fish, isopods, bivalves, decapod crabs	larger piscivorous fish	rapid decline in water temp. can cause mortality	higher in backwater than seagrass beds. 15-20 mm/month

Late Juvenile	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore	SAV, soft bottom, hard bottom, sand/shell	fall	> 5-30	0-5	mysids, amphipods, shrimp, polychaetes, insects, crabs, fish	amberjack, sharks, larger piscivorous fish	changes in environment, disease, parasites, rapid decline in water temp.	15-20 mm/month
Adult	ER-1, ER-2, ER-3, ER-4, ER-5	estuarine, nearshore, offshore	SAV, emergent marsh, soft bottom, hard bottom, sand/shell, WCA		2-33	1-70	crabs, shrimp, fish	sharks	*M* (age-constant) = 0.07-0.13	L_{inf} = 881 mm FL, *k* = 0.32, t_0 = -1.29, max. age = 42 yrs TL= 68 cm (A)
Spawning Adult	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	SAV, soft bottom, hard bottom, sand/shell	mid Aug - Oct Aug-Sep (C)	20-30	40-70		sharks		L_{50} (male) = 529 mm FL, L_{50} (female) = 825-900 mm FL

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

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A.5 Spiny Lobster

Spiny lobster

Spiny Lobster										
Panulirus argus										
Life stage	**Eco-region**	**Habitat Zone**	**Habitat Type**	**Season**	**Temp (°C)**	**Depth (m)**	**Prey**	**Predators**	**Mortality**	**Growth**
phyllosome Larvae	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	WCA	year-round (FL Keys; SE FL), Jun-Nov (NE Gulf)	> 24	***1-100***	plankton	pelagic fish		~11 molts over 9-12 month larval cycle. Size: 0.5-12 mm carapace length
puerulus Post Larvae	ER-1	estuarine, nearshore, offshore	WCA, SAV	year-round, peak: spring, secondary peak: fall	18-33	***1-100***	non-feeding	nocturnally active, water column feeding fish	predation, physiological stress from temp and salinity extremes	metamorphose into first K5thic instar 7-21 d post-settlement
juveniles	ER-1	estuarine, nearshore, offshore	SAV, reefs, hard bottom	year-round		***1-100***	inverts (esp. mollusks, crustaceans)	elasmobranchs, boney fish, octopods, portunid crabs	mortality ~ 95% primarily via predation, commercial fishery	3-4 mm CL/month during first year, influenced by temp, diet, and injuries
Adult	ER-1	estuarine, nearshore, offshore	hard bottom, SAV, reefs	year-round		1-100	mollusks, arthropods	elasmobranchs, boney fish, dolphins, loggerhead turtles	fishery exploitation, estimated to be 90%	S.FL = 0.6 mm CL/month, affected by temp and injuries max length= 1 m

**asterisks indicate data collected from outside the Gulf*
Bold and italicized font indicates proxy data

Spiny Lobster References

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APPENDIX B. METADATA

Contemporary benthic habitat spatial layers were used to construct EFH maps for all federally managed shrimp and finfish species (**Alternative 2**). Habitat shapefiles from the 2016 EFH 5-year review were combined with updated spatial files provided during 2023/24 Council contracted work using the 'Merge' feature class tool in ArcMap to create a uniform polygon layer to describe presence of that habitat Gulf-wide. In some cases, multiple data sources for individual habitat characterization were obtained. To combine the multiple habitat data layers in these instances, the 'Merge' feature class tool in ArcMap was used. Then, combined features were dissolved using the 'Dissolve' tool in ArcMap to create a uniform polygon layer to describe presence of that habitat throughout the Gulf. The extent of the layers was also cropped to the EEZ boundary of the Gulf, and Eco-region boundary using 'Clip' tool in ArcMap when the extents of combined layers were larger. For hard bottom habitat type, only polygons with an area >10km^2 were retained for mapping purposed. It is important to note, that although hard bottom habitat <10km^2 may not be visually depicted on the maps, all hard bottom habitat is considered Essential Fish Habitat, as defined in the EFH textual definitions. No spatial data currently exist to inform drifting algae and banks/shoals habitat type. As such, those habitat types were not used in creating EFH Level 1 species maps, but are included in the EFH textual definitions and Habitat attribute tables.

A summary of the metadata provided during the Council-led 2023/24 contracted work, by habitat type is provided below. Additionally, please find below the link to the Google Drive, Gulf Council, which includes all spatial data and metadata collected during the 2023/24 contracted work. The drive is organized into folders per Gulf State, and within each state folder, there are subfolders containing all shapefiles for each habitat type and associated metadata. The Google Sheet named 'Contact Log' lists everyone contacted during the project and the outcomes, while the sheet titled 'Email Contacts and Shapefiles of Used Data' is a running list of all data collected and their sources.

Google Drive Link: https://drive.google.com/drive/folders/1qx9lop8Wgq2YAcrRIYJ-kR-YH9KWSdtF?usp=sharing

Submerged Aquatic Vegetation (SAV)

Florida

Title: Salt Marshes in Florida
Creator: Florida Fish and Wildlife Conservation Commission
Timeseries: 1999-2020, updated 2023
Eco-region: 1-3
Data Source: Florida Fish and Wildlife Conservation Commission GIS Librarian

Texas

Title: 2018 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2018)
Timeseries: 2018
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: 2017 Seagrass

Creator: University of Texas Marine Science Institute (Dunton, K., 2017)
Timeseries: 2017
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi
Title: 2015 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2015)
Timeseries: 2015
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: 2014 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2014)
Timeseries: 2014
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: 2013 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2013)
Timeseries: 2013
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: 2012 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2012)
Timeseries: 2012
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: 2011 Seagrass
Creator: University of Texas Marine Science Institute (Dunton, K., 2011)
Timeseries: 2011
Eco-region: 5
Data Source: The HARTE Research Institute - Texas A&M Corpus Christi

Title: TPWD Christmas Bay and West Galveston Bay 2015
Creator: Texas Parks and Wildlife Department Coastal Fisheries Division Habitat Assessment Team
Timeseries: 2015
Eco-region: 5
Data Source: Texas Parks and Wildlife Department Coastal Fisheries Division Habitat

Title: TPWD Seagrass 2000-2005
Creator: Texas Parks and Wildlife Department
Timeseries: 2000-2005
Eco-region: 5
Data Source: Texas Parks and Wildlife Department

Title: TPWD Seagrass 2012
Creator: Texas Parks and Wildlife Department
Timeseries: 2012
Eco-region: 5
Data Source: Texas Parks and Wildlife Department

Title: NOAA Seagrass 2012
Creator: National Oceanic and Atmospheric Administration
Timeseries: 2012
Eco-region: 5
Data Source: Houston Advanced Research Center

Louisiana

Title: Coastal Information Management System Vegetation
Creator: U.S. Geological Survey, Geographer, S. Hartley
Timeseries: created 2022
Eco-region: 3,4
Data Source: U.S. Geological Survey.
https://cims.coastal.louisiana.gov/Viewer/GISDownload.aspx

Title: Louisiana and Lower Mississippi River 2014 ESI BENTHIC Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2013
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIL (Environmental Sensitivity Index - Lines)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESI HABITAT Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2013
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Submerged aquatic vegetation and environmental data for coastal areas from Texas through Alabama, 2013-2015
Creator: U.S. Geological Survey; La Peyre, M., DeMarco, K., Hillmann, E.
Timeseries: 2013-2015, created 2017
Eco-region: 3-5

Data Source: U.S. Geological Survey data release;
https://www.sciencebase.gov/catalog/item/588605dde4b0496b79d7945a

Alabama

Title: Seagrass_AL_FL_MS_TX (Seagrass_ALFLMSTX)
Creator: NOAA/ NESDIS/ NODC/ NCDDC (National Coastal Data Development Center)
Timeseries: 1987-1999, created 2004
Eco-region: 3
Data Source: USGS, NOAA, NESDIS, NODC, NCDCC

Mangroves

Florida

Title: Mangrove Habitat in Florida
Creator: Florida Fish and Wildlife Conservation Commission
Timeseries: 1999-2020, updated 2023
Eco-region: 1,2
Data Source: Florida Fish and Wildlife Conservation Commission GIS Librarian

Mississippi

Title: Mangrove distribution in the southeastern United States in 2021
Creator: University of Michigan (Bardou, R.)
Timeseries: created 2022
Eco-region: 1-5
Data Source: . https://www.sciencebase.gov/catalog/item/61eb07ddd34e8b818ada4948
U.S. Geological Survey – ScienceBase

Title: Global Distribution of Mangroves USGS
Creator: The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
Timeseries: 1997-2000, updated 2023
Eco-region: 1-5
Data Source: UNEP -WCMC

Louisiana

Title: Louisiana Barrier Island Comprehensive Monitoring Program – habitat mapping
Creator: U.S. Geological Survey; Enwright, N.M., SooHoo, W.M., Dugas, J.L., Lee, D.M., Borrok, P.S.
Timeseries: 2008-2016, updated 2018
Eco-region: 3,4
Data Source: U.S. Geological Survey;
https://data.usgs.gov/datacatalog/data/USGS:5ced8c28e4b02eb068de9459

Title: Louisiana and Lower Mississippi River 2014 ESIP (Environmental Sensitivity Index - Polygons)

Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Drifting algae
No spatial information available.

Emergent marshes
Mississippi

Title: Global Distribution of Salt Marshes USGS
Creator: The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
Timeseries: 1973-2015, updated 2023
Eco-region: 1-5
Data Source: UNEP -WCMC

Louisiana

Title: Louisiana Barrier Island Comprehensive Monitoring Program – habitat mapping
Creator: U.S. Geological Survey; Enwright, N.M., SooHoo, W.M., Dugas, J.L., Lee, D.M., Borrok, P.S.
Timeseries: 2008-2016, updated 2018
Eco-region: 3,4
Data Source: U.S. Geological Survey;
https://data.usgs.gov/datacatalog/data/USGS:5ced8c28e4b02eb068de9459

Title: Louisiana and Lower Mississippi River 2014 ESIL (Environmental Sensitivity Index - Lines)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIP (Environmental Sensitivity Index - Polygons)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Vegetation types in coastal Louisiana in 2013
Creator: Wetland and Aquatic Research Center' Sasser, C.E., Visser, J.M., Mouton, E., Linscombe, J., Hartley, S.B.

Timeseries: created 2013
Eco-region: 3,4
Data Source: https://www.usgs.gov/maps/vegetation-types-coastal-louisiana-2013; https://pubs.usgs.gov/publication/sim3290; https://pubs.usgs.gov/sim/3290/downloads/

Title: Vegetation types in coastal Louisiana in 2021
Creator: U.S. Geological Survey
Timeseries: created 2022
Eco-region: 3,4
Data Source: https://www.sciencebase.gov/catalog/item/6217a23fd34ec739b2dd245e

Title: National Wetlands Inventory - Louisiana
Creator: U.S. Fish and Wildlife Service
Timeseries: created 2023
Eco-region: 3,4
Data Source: https://www.fws.gov/program/national-wetlands-inventory/download-state-wetlands-data

Alabama

Title: al1849_1867
Creator: USGS
Timeseries: created 2004
Eco-region: 3
Data Source: USGS

Title: al1918_1957
Creator: USGS
Timeseries: created 2004
Eco-region: 3
Data Source: USGS

Title: al1978_1981
Creator: USGS
Timeseries: created 2004
Eco-region: 3
Data Source: USGS

Title: al2001
Creator: USGS
Timeseries: created 2004
Eco-region: 3
Data Source: USGS

Sand/shell bottoms

Texas

Title: Shell Compano Bay
Creator: Houston Advanced Research Center
Timeseries: N/A
Eco-region: 5
Data Source: Houston Advanced Research Center

Title: Sand Compano Bay
Creator: Houston Advanced Research Center
Timeseries: N/A
Eco-region: 5
Data Source: Houston Advanced Research Center

Mississippi

Title: Seafloor Substrate Griddings, Gulf of Mexico
Creator: INSTAAR, University of Colorado (Jenkins, C.J.)
Timeseries: created 2011
Eco-region: 1-5
Data Source: https://www.ncei.noaa.gov/maps/gulf-data-atlas/atlas.htm?plate=Bottom%20Sediments%20-%20Types

Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIL (Environmental Sensitivity Index - Lines)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIP (Environmental Sensitivity Index - Polygons)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Soft bottoms

Texas

Title: Mud Compano Bay
Creator: Houston Advanced Research Center
Timeseries: N/A
Eco-region: 4,5
Data Source: Houston Advanced Research Center

Mississippi

Title: Seafloor Substrate Griddings, Gulf of Mexico

Creator: INSTAAR, University of Colorado (Jenkins, C.J.)
Timeseries: created 2011
Eco-region: 1-5
Data Source: https://www.ncei.noaa.gov/maps/gulf-data-atlas/atlas.htm?plate=Bottom%20Sediments%20-%20Types

Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIL (Environmental Sensitivity Index - Lines)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIP (Environmental Sensitivity Index - Polygons)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Vegetation types in coastal Louisiana in 2013
Creator: U.S. Geological Survey, Geographer, S. Hartley
Timeseries: created 2014
Eco-region: 3,4
Data Source: U.S. Geological Survey. https://www.usgs.gov/maps/vegetation-types-coastal-louisiana-2013; https://pubs.usgs.gov/publication/sim3290; https://pubs.usgs.gov/sim/3290/downloads/.

Hard bottoms

Florida

Title: Coral and Hard Bottom Habitats in Florida
Creator: Florida Fish and Wildlife Conservation Commission
Timeseries: 1970s-2011
Eco-region: 1-5
Data Source: Florida Fish and Wildlife Conservation Commission GIS Librarian

Texas

Title: Shellfish Harvest Area
Creator: Houston Advanced Research Center
Timeseries: N/A
Eco-region: 4
Data Source: Houston Advanced Research Center

Mississippi:

Title: Seafloor Substrate Griddings, Gulf of Mexico

Creator: INSTAAR, University of Colorado (Jenkins, C.J.)
Timeseries: created 2011
Eco-region: 1-5
Data Source: https://www.ncei.noaa.gov/maps/gulf-data-atlas/atlas.htm?plate=Bottom%20Sediments%20-%20Types

Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESIL (Environmental Sensitivity Index - Lines)
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Alabama

Title: Deepseacorals (deep_sea_corals_6cb7_510e_0a83)
Creator: NCEI/NOAA
Timeseries: created 2016
Eco-region: 1-5
Data Source: https://gulfatlas.noaa.gov/

Oyster reefs

Florida

Title: Oyster Beds in Florida
Creator: Florida Fish and Wildlife Conservation Commission
Timeseries: data from 2001, 2009-2016, 2022
Eco-region: 1-3
Data Source: Florida Fish and Wildlife Conservation Commission GIS Librarian

Texas

Title: Compano Bay Oyster
Creator: Texas Parks and Wildlife Department
Timeseries: N/A
Eco-region: 5
Data Source: Texas Parks and Wildlife Department

Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESI BENTHIC Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2013
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana Department of Wildlife and Fisheries Oyster Leases, Public Seed Grounds, and Clutch Plants
Creator: Louisiana Department of Wildlife and Fisheries; Temento, L.

Timeseries: created 2023
Eco-region: No information available
Data Source: Louisiana Department of Wildlife and Fisheries

Title: Louisiana and Lower Mississippi River 2014 ESI BENTHIC Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2013
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Alabama

Title: Nearsubreefs (physical_data_oyster_reef_2015_2016)
Creator: Dauphin Island Sea Lab; Schrand, M., Powers, S., Szedlmayer, S.
Timeseries: created 2017
Eco-region: 3
Data Source: Dauphin Island Sea Lab

Title: Alabama_Public_Oyster_Reefs
Creator: Alabama Marine Resources Division
Timeseries: 1968, 1996, and 2001
Eco-region: 3
Data Source: Alabama Department of Marine Resources. Inaccessible to public (file was sent in a private folder)

Title: Alabama_Oyster_Plantings
Creator: Alabama Marine Resources Division
Timeseries: 2007-2016
Eco-region: 3
Data Source: Alabama Department of Marine Resources. Inaccessible to public (file was sent in a private folder)

Title: Alabama_Coastal_Waters_AMRD_revised_generalize
Creator: Alabama Marine Resources Division
Timeseries: 2007-2016
Eco-region: 3
Data Source: Alabama Department of Marine Resources. Inaccessible to public (file was sent in a private folder)

Banks/shoals:
No spatial information available

Reefs
Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESI BENTHIC Polygons

Creator: NOAA Office of Response and Restoration
Timeseries: created 2013
Eco-region: 3,4
Data Source: https://response.restoration.noaa.gov/esi_download#Louisiana

Alabama

Title: 0-9 Mile Reef Coordinates
Creator: Coastal Conservation Association of Alabama, Alabama Charter Fishing Association, and Alabama Wildlife Federation; Powers, S., Szedlmayer, S.
Timeseries: 1975-2021, created 2021
Eco-region: 3
Data Source: Alabama Department of Conservation and National Resources Marine Resources Division

Title: Alpublicreefs (Master_List_AL_Public_Reefs)
Creator: Coastal Conservation Association of Alabama, Alabama Charter Fishing Association, and Alabama Wildlife Federation; Powers, S., Szedlmayer, S.
Timeseries: 1973-2023, created 2023
Eco-region: 3
Data Source: Alabama Department of Conservation and National Resources Marine Resources Division

Shelf edge/slope

No new spatial information was acquired.

Water Column Associated (WCA)

Florida

Title: West Florida Shelf Benthic Habitats
Creator: Florida Fish and Wildlife Conservation Commission
Timeseries: Unknown, updated 2017
Eco-region: 1,2
Data Source: Florida Fish and Wildlife Conservation Commision GIS Librarian

Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESI INVERTEBRATE Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4
Data Source: InPort (NOAA Fisheries and National Ocean Service).
https://response.restoration.noaa.gov/esi_download#Louisiana

Title: Louisiana and Lower Mississippi River 2014 ESI FISH Polygons
Creator: NOAA Office of Response and Restoration
Timeseries: created 2014
Eco-region: 3,4

Data Source: InPort (NOAA Fisheries and National Ocean Service).
https://response.restoration.noaa.gov/esi_download#Louisiana